THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XII. No. 291—15th YEAR.] LONDON, DECEMBER 15, 1863. [Subscription per Ann. { 15s. in Advance / 18s Credit.] Price 8d. Unstamped.

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FIRE-BRICKS (marked "RAMSAY") OF ALL DESCRIPTIONS.

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Manufactory established in 1804.

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Gas Office, South Shields, Dec. 10, 1863.

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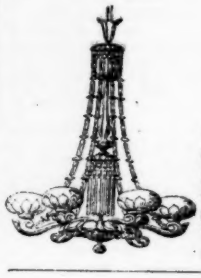

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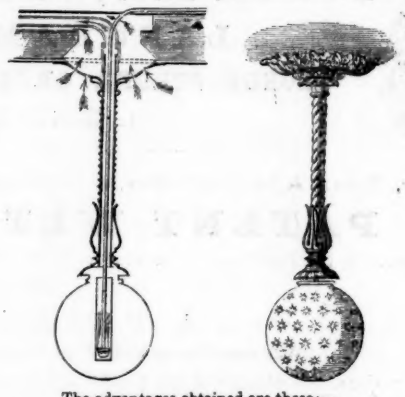

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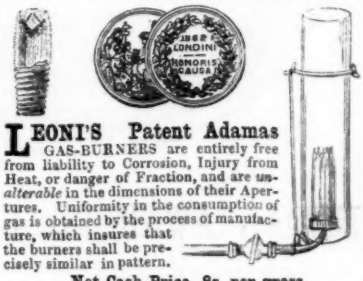
The directors do not pledge themselves to accept the lowest or any tender.

WILLIAM JACKMAN, Superintendent.

Broadley Street, Hull, Dec. 1, 1863.



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On WHEELS. Constructed expressly for Gas-Works, for cleansing the pipes and apparatus of accumulations of Naphthaline, Congealed Tar, &c.; Thawing Gasholder Tanks, and the Frozen Water Lutes of Telescopic Gasholders, Working Steam Engines, &c. They are used in London at the

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COMMERCIAL "
LONDON "
EQUITABLE GAS-WORKS,
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LEVER-VALVE GAS-METERS,

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The particular construction of which renders them less liable to cause trouble by putting out the lights, owing to their being made conformable to the

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STATION-METERS, GOVERNORS, PRESSURE-REGISTERS, EXPERIMENTAL METERS, and PHOTOMETERS, on the most improved principle.

Old Meters, of any Maker, repaired and altered, to meet the requirements of the SALE OF GAS ACT.

December, 1863.

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MEDAL AWARDED BY THE JURY, INTERNATIONAL EXHIBITION,

1862,

To THOMAS GLOVER,

SUFFOLK STREET, CLERKENWELL GREEN, LONDON.

THOMAS GLOVER has great pleasure in informing Gas Companies and his other Patrons, that the *Jury of Class XXXI. of the International Exhibition of* 1862 have awarded, for his Patent Dry Gas-Meter, *a Prize Medal.* The reason given for this Award, in the Juries Official Report, is, *"For excellence of manufacture, as regards Dry Meters."* See Official Report, p. 346.

It is worthy of remark, that the only two other Firms who receive Awards *both manufacture imitations of Thomas Glover's* Patent Dry Gas-Meter, and the reason given for these Awards is *"construction* and sound workmanship." Thomas Glover, therefore, claims that the *construction* of his Meter has obtained *three Awards from the Jury of the International Exhibition of* 1862; at the same time, *contrasting* the Award granted for his Meter by the words, *"For excellence of manufacture, as regards Dry-Meters."*

The Prize Meter was exhibited in Class XXXI., No. 6301, connected with a 1-foot holder, to demonstrate that a 50-light Meter *measures and indicates accurately the small quantity of One Foot.*

WILLIAM PARKINSON AND CO.

(SUCCESSORS TO SAMUEL CROSLEY),

PATENT WET AND DRY GAS-METER MANUFACTURERS, &c.

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Established 1816.

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W. P. and Co. invite especial attention to this Meter, which entirely overcomes the difficulty to which ordinary Wet Meters are subjected, owing to the short range of the Float, which is necessary, in order to meet the requirements of the Sale of Gas Act.

"It is well known that n Meters constructed so that the valve will close when the water is drawn off to such a point as to render them 3 per cent. slow the lights are liable to be extinguished by the closing of the valve by a sudden increase of pressure. To meet this difficulty, Mr. Pinchbeck has invented an ingenious and simple arrangement by which the action is reversed, and any such increase of pressure, in his Meter, raises the value instead of depressing it. The fact of the improvement having been adopted by Messrs. W. Parkinson and Co. is a sufficient guarantee that it practically and effectually remedies the inconvenience it is designed to meet."—JOURNAL OF GAS LIGHTING.

PATENT IMPROVED DRY METER,

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STATION-METERS AND GOVERNORS.

Which can be seen at all the London Gas-Works. Also Liverpool, Manchester, Sheffield, Nottingham, Belfast, Glasgow, Birmingham, Dublin, Bristol, Leeds, Leicester, Brighton, Southampton, Sunderland, Wolverhampton, Bradford, Norwich, &c., &c.

TEST GASHOLDERS, EXPERIMENTAL METERS, EXHAUSTER REGULATORS,

MINUTE CLOCKS, PRESSURE GAUGES, PHOTOMETERS, PRESSURE REGISTERS, &c.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

J. Easson.—*Certainly not. This was settled in the case of* Dicks v. the Equitable Gas Company, *reported in the* Journal *for Nov.* 20, 1860.

NOTICES.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 15, 1863.

Notes upon Passing Events.

The Metropolitan Board are at sea again—on the boundless sea of sewage. They have not received a tender that satisfies their expectations. The Board seem convinced that the sewage must be applied to irrigation, and very properly want to know where it is to be distributed, fearing, not unnaturally, that they may be the unwilling authors of a greater nuisance than that which the main drainage scheme will remove. The following amendment, proposed by Mr. D'Iffanger, and carried by a considerable majority, embodies more good common sense than we usually find in discussions on this really plain, but much-vexed question:—

"That inasmuch as the Board were bound by various provisions of the several enactments under which their works are carried on, so to conduct them as not to cause a nuisance, and that the profitable employment of sewage, under the schemes proposed in the tenders, may involve its application to the surface of the land on an extensive scale, they cannot be parties to any agreement for such application, unless they have clear information on the localities, nature, and extent of the land to be so dealt with, and satisfactory assurance that the processes to be employed are such as not to cause a nuisance. That none of the tenders received are sufficiently clear on this point; the Board, therefore, refer them generally to the Main Drainage Committee, in order to obtain essential and detailed information, and to confer with the several promoters as to other conditions of the advertisements, upon which their proposals are neither full nor explicit, and generally to consider as to the utilization of the sewage."

In the course of the discussion, Mr. Newton made a cruel cut at our old friend, Alnaschar Ellis. He said that if, instead of the promised half share of profits, amounting to £787,000, offered by the *figurative* speculator, he would only give a proper guarantee for £250,000, he would vote that his tender be accepted! Of course, no one took up the offer, for although Mr. Ellis can get reams of resolutions from meetings where three tailors represent the sense of the parish, guarantees are an article not purchaseable in his market. Never was money more plentiful—never were joint-stock companies more easily launched; but a sewage company has not yet found a substantial promoter. We give up the subject until it appears in a more substantial shape than that of parochial speeches from small tradesmen, who despise the practical knowledge of farmers and agricultural chemists, but would be very loth to trust the purchase of their butter, cheese, tobacco, tea, brandy, or drapery goods to unskilled, unpractised common sense.

The Metropolitan Board has also tried and honourably acquitted Mr. Bazalgette of all the charges and insinuations arising out of Sir John Hare's Bill in Chancery. Nothing can be more full and comprehensive than the terms in which a report—signed by a number of honourable men—concludes. They say:—

For these reasons they have arrived at the following resolutions, which they have unanimously agreed to submit to your honourable Board:—

That Mr. Bazalgette, the engineer, having been engaged with Sir John Rennie, in recommending a contractor for carrying out certain works at Odessa, for which he, jointly with Sir John Rennie, was to receive a commission, and the person recommended, and who undertook the same, being a contractor for the execution of works under the Board, the committee disapprove of their engineer having engaged in any transaction with any contractor without the consent of the Board, and in contravention of the terms of his appointment, although in respect of works to be performed in a foreign country.

That they find that Mr. Bazalgette, from the first, expressed his readiness to relinquish all his interest in the Odessa contract, which course he has adopted.

That, after a most anxious inquiry into the whole facts of the case, they are satisfied that there has been nothing reflecting in any way on Mr. Bazalgette's professional or personal honour, and are satisfied that he has throughout discharged his duty, both to the Board and their contractors, with ability, impartiality, and integrity.

All which your committee beg to submit.

(Signed)

J. Thwaites,
P. H. Le Breton,
E. Shepherd,
E. C. Dermer,
J. S. Phillips,
J. Moreland,
P. M'Donnell,
P. Crellin,
W. Newton,
R. Freeman,
J. D. A. Samuda,
G. B. Richardson,
J. J. Tanner.
B. H. Adams,
E. Collinson,
J. Pew,
H. Bidgood,
J. Long,
T. D'Iffanger.
Robert Taylor.
F. Healey,
Silas Taylor,
J. O. Hall,
W. Tite,
B. Dixon.

After this, the least the Board can do is to raise their engineer's salary to £3000. At that sum, with the main drainage and the Thames embankment on his hands, he is an extremely cheap officer. On the same expenditure most engineers would expect 5, and many would somehow earn 10, per cent.

There are, however, one or two features in this transaction on which we cannot help making a few remarks. In the first place, we do not share in the horror expressed by some untried or uninformed purists at the idea of a professional man, with special knowledge, availing himself of his professional position to obtain additional income. It may be contrary to the letter of a contract, but is done, and done without disadvantage to employers, in every profession. The awkward part of the business was the mixing up of one contractor in two capacities. However, as the Metropolitan Board, who ought to know, are satisfied, less-informed people ought not to doubt. One point that puzzles us is why, if the services rendered by Mr. Bazalgette were as trifling and unimportant as

he represents—which "could be done at leisure hours and "within a short period"—did Sir John Rennie, an engineer, and Mr. Furness, a contractor of experience, agree to pay him a sum of not less than £5000, and, according to some statements, exceeding £15,000? These are large sums to be earned in toothpicking time. We have known some princely contractors; but never, in the most halcyon days of Great George Street, did we hear of tens of thousands presented to an engineer as a reward for advice matured in a few evenings.

Again, if Mr. Bazalgette is so ready, at the hint of a friend at the Board, to surrender what must be to him, and would be to most men of his position, a handsome fortune, why did he not think of this a little sooner, and, by an amiable understanding with Sir John Hare and Sir John Rennie, save himself a great scandal and a serious loss? It is an old story—old as Æsop—the dog and the shadow, who was a near relation to the dog in the manger. We cannot imagine that Mr. Furness will in the end consent to take advantage of Mr. Bazalgette's advice on the sewering of Odessa, and his late paraphrase of *Nolo Episcopari*.

Some sections of the press are loud in their denunciations of what they call the railway conquest of London. One railway would like to take all the Haymarket; another has a maw capacious enough for Leicester Square; a third would like to consume a good slice of the purlieus behind the Strand. And, pray, why not? Supposing always that the parishes lost nothing in rates, who would lose? Certainly not the owners of the property appropriated: they are always well paid. Certainly not the public, as far as air and light are concerned, for a railway-station implies improvement in both: of that fact, every metropolitan station is an evidence. Certainly not in the loss of the class of property threatened: London can spare the districts threatened, without any serious social, moral, or architectural damage. The one serious objection is to any lines, like the Underground, that obstruct the traffic of great thoroughfares for an unlimited period during construction. For that there is no compensation: the total clearance of property is easily paid for. But these outcries are about as effective as General Tom Thumb (in the character of Ajax) defying the thunder. The convenience of the Charing Cross Railway-Station—which has raised the South-Eastern Company to a first-rate position for negotiation—will conquer all opposition, and smooth over all prejudices. Every great railway must, before ten years are passed, have a station on the Thames; and a flotilla of steamers will be raised to serve them.

The Lord Chancellor, who is not a man to be beaten at one failure, comes again with his centralized Palace of Justice in the Strand; and, being now warm in his seat in the Cabinet, will probable secure at least the genuine support of his colleagues and subordinates. If report speaks truly, his scheme was thrown over last session by the commission of which Mr. Cowper is president. The Palace of Justice and the Strand Hotel together will annihilate a wonderful camp of squalid vice, dirty poverty, and mean architecture—a disgrace to our metropolis and our country.

There has been "a pretty little quarrel as it stands," of late, between Mr. Tite and Mr. Rawlinson, upon the subject of the brick ceiling over St. George's Hall, at Liverpool, which certainly shows a remarkable degree of susceptibility on the part of the worthy engineer of the local government office; though, having once put forth his claims to the invention of the style of roofing in question, we hardly see how he could have remained silent under the attack of the honourable Member for Bath. Mr. Tite appears to have taken the opportunity that was offered him on the occasion of proposing a vote of thanks to Mr. Sydney Smirke, for a paper read by the latter at the Royal Institute of British Architects, on the life and works of the late C. R. Cockerell, Esq., R.A., to call the attention of the profession to the attempt that was made by Mr. Rawlinson to obtain the credit for the execution of the ceiling at Liverpool. Mr. Rawlinson was not present at the meeting; but he read the remarks of the *Building News* upon the subject of Mr. Tite's observations apparently in great wrath, and thereupon he indited an angry letter to a Liverpool paper, to the *Building News*, and to the *Builder*, in which, whilst confounding the remarks made by the critic of the *Building News* with those of Mr. Tite, he very warmly reiterated his claim to the design of the said roof.

Now, the facts of the case lie, as it seems to us, in a very small compass. The ceiling of St. George's Hall was originally designed by Mr. Elmes to be vaulted in brick, and, as such, it formed part of the original estimate. Mr. Rawlinson was, up to 1843, engaged in the surveyor's department of the corporation of Liverpool as an assistant draughtsman, where he may naturally have become acquainted with Mr. Elmes, who had then advanced considerably with St. George's Hall, and had been assisted in the arrangements that were concerned with the locality by the town surveyor. Mr. Elmes shortly afterwards was obliged to go to the West Indies, in consequence of his failing health, and it appears that he employed Mr. Rawlinson to superintend the execution of the ceiling for him. There is not, we believe, to be found in the accounts of St. George's Hall any entry of payment to Mr. Rawlinson, so that he must have been considered to have been employed by Mr. Elmes, who still continued reponsible for whatever was done there, until Mr. Cockerell was appointed to superintend the finishing of the details in the year 1847. Mr. Elmes had, as we said before, designed the roof with *solid* brick; all that Mr. Rawlinson could lay claim to was the merit of the notion of executing it in *hollow* bricks; but this idea was not new, nor was it proposed on his own responsibility, even if he had not been aware of the fact of the execution of such roofs some thousand years before. There was, in Mr. Rawlinson's pretence to the merit of this so-called discovery, something which savours strongly of the presumption of a clerk of the works who will coolly claim to have invented the style of execution that the architect may allow him to adopt. As well might Mr. Fairbairn or Mr. E. Hodgkinson claim the invention of the wrought-iron tubes of the Menai Bridge, as Mr. Rawlinson that of the hollow bricks that he was allowed to use by Mr. Elmes in this case.

But the absurdity of the matter was in the attempt of Mr. Rawlinson to claim any merit on the score of the originality of the invention of the hollow bricks. The vaulting of the baths of Caracalla and Diocletian, at Rome, were made with brick ribs, and they were filled in with hollow pots to secure their lightness; the Church of St. Vitale, at Ravenna, was formed of hollow jars lying one inside the other in a circle; the Halle aux Vins, of Paris, had been roofed with hollow pots by M. Gauche, the Chamber of Deputies by M. Joly; the Bank of England had some specimens, and the buildings lately pulled down in Downing Street also, both by Sir John Soane; so that the models for the execution of the hollow bricks cannot have been wanting to whomsoever designed the ceiling of St. George's Hall. Mr. Rawlinson has been but another illustration of the French saying, if he thinks that there was any originality in his dealing with the roof of the building he was employed upon; he has been, in fact, an "*enfonceur des portes ouvertes*," and has simply repeated the ideas of those who had gone before him, even if the credit of the execution of the ceiling be due to him, which we think it was not. Mr. Elmes would have had to bear all the blame had there been a failure: he ought to have all the credit that has attended the success of the experiment, whatever that might be, though we think that it would be far less than Mr. Rawlinson appears to think that it should. As to the concluding part of Mr. Rawlinson's letter, in which he states that he used his influence to prevent Mr. Tite being consulted with respect to the finishing the building, it is marked with supreme bad taste, to say the least of it. Mr. Tite is too distinguished a member of his profession to feel any vexation at the declaration of Mr. Rawlinson's dislike; and at the time alluded to Mr. Rawlinson could hardly have had much influence with the body whose employment he had just left as assistant-draughtsman, at a salary of £150 a year. It is, however, mortifying to an architect or engineer of merit to be obliged to submit his designs to the approval of such a man, who is so ignorant of the past history of his profession as to think that he invented hollow bricks for the purpose of forming the ceiling of a hall.

Circular to Gas Companies.

THE attempts made by local authorities to obtain a supply of gas to the public lamps on more advantageous terms than private consumers, give rise to at least nine-tenths of the disputes between gas companies and their customers, and often occasion a greater expenditure of money in parliamentary contests than the amount of the differences in dispute. It would be greatly to the advantage of gas companies and of the public that some principles should be established by which all such

disputes might be adjusted, and we trust that in the ensuing session of Parliament some measures may be taken to secure that object, by prohibiting such gas companies as may then be promoting Bills from supplying gas to the public lamps at a lower rate than they charge to the most favoured consumer for the time being. We have, again and again, contended for an equalization of the price of gas supplied to private consumers and to public lamps, and in several recent Gas Acts that principle has been recognized; but local authorities, not satisfied with being treated on the same terms as the most favoured consumers, claim special privileges, for which there is no foundation in justice or expediency. The pleas generally adduced in favour of such claims are, that the local authorities are larger consumers of gas than any other customers, that the cost of collection is less, and there are no bad debts. It is sometimes further urged, when gas companies are without parliamentary powers, that they ought to supply gas to the public at a cheaper rate for the privilege of breaking the pavement to lay down their mains and service-pipes. The advantage derived by gas companies from the facility of collecting a large sum of money from one customer, and without risk of loss, is estimated to amount to 2½ per cent.; but that advantage is fully counterbalanced by the additional expense of laying and keeping in repair a service-pipe to each lamp, with the accompanying leakage which so many service-pipes for the supply of separate lamps occasions. Each street-lamp may, indeed, be regarded as a supply to a separate customer who only burns a single light, the leakage at every one being equal to that of a service-pipe that would supply a dozen lights. In accordance with strict justice, therefore, the local authorities ought to pay for the gas supplied to the street-lamps the same price that is charged to the smallest consumers; yet, according to the suggestions of Mr. Hughes, they should have a discount of 25 per cent. Such pretensions had their origin in the early days of gas lighting, when permission to break the pavement to lay mains and pipes was purchased from the local authorities by the supply of gas to the street-lamps at unremunerative prices; and similar conditions have not unfrequently been extorted from competing companies. At the present day, however, when the introduction of gas lighting is considered a public benefit, the plea that gas companies ought to pay the public for the annoyance occasioned in laying their pipes is ridiculous. Nevertheless, if the question were limited to the gas companies and the local authorities, without affecting gas consumers generally, such attempts at exaction, though unjust and impolitic, might be defended on the ground that they were made for the public good. But in most of these contests, the real question is, whether the private consumer of gas shall pay a higher price per 1000 feet to enable the gas company to charge less for lighting the public lamps. At Worcester, the dispute between the Lighting and Watching Committee and the gas company was brought to the issue, whether there should be a reduction in the price of gas supplied to private consumers or to the public lamps, and as the company considered it most fair to all that the prices should be equalized, they preferred making a reduction to the private consumer. At the meeting of the Town Council on the 1st instant, several members concurred in the view taken by the gas company; and one of them expressed the opinion that "it is wrong in "principle to saddle private consumers with the saving effected "in the price paid for the public lamps." This opinion appears to have influenced the Town Council to modify their previous demands, and an amicable compromise was made with the chairman of the gas company, who undertook to reduce the charge for the street-lamps from £3. 10s. per lamp to £3. 5s., which reduction, it was understood, would not prevent the company from carrying out their intention to give private consumers the benefit of a reduction to 4s. per 1000 feet.

In despite of the assiduous efforts of Mr. Hughes to propagate his 25 per cent. theory of public lighting, we are glad to observe that they produce little effect, and that the agitation of the subject has, on the contrary, tended to expose the injustice of such a proposition. Private consumers in several parts of the country are taking the matter up, and are protesting against being charged a high price for gas for the purpose of lowering the price of public lighting. We noticed in our last a memorial on the subject from a body of tradesmen at Weston-super-Mare to the Local Board, and on the opposite side of the kingdom expression is given to the same opinion in the *Yarmouth Independent*. That paper, though generally hostile to the gas company, advocates an advance in the price charged to the corporation, provided the price to private consumers is reduced. "The public lamps," it is observed, "are for the benefit of the public, and it seems to "us much fairer to make the public pay for them, and alle-"viate the burden on the private consumers, than to saddle "the private consumers with the cost of the advantages en-"joyed by the general body of the public." These remarks were made in reference to a dispute between the corporation and the gas company of Yarmouth, and the threatened formation of a competing company in that town, unless the existing company consent to sell their works to the corporation or reduce the price of gas supplied to the public lamps. The *maximum* dividend on their amalgamated capital which the company are allowed by their Act of last session is 8½ per cent., and that amount the corporation offer to guarantee for the possession of the gas-works. They can have no object in wishing to purchase except as a source of profit, and in making that offer they must anticipate gaining more than 8½ per cent. by the undertaking. Such additional profit, however, could only be gained at the cost of the consumers, either by charging them an increased price, or by maintaining it at a higher rate than the company could be allowed to charge; unless, indeed, it be supposed that the gas-works would be managed better and more economically by paid officers of the corporation, than by the company who have a direct interest in the concern. Why the gas company should refuse to sell on the terms proposed is not quite clear, but it is evident that the *public* could not be benefited by such a change of management, and might experience considerable loss.

We hoped that the question of the public lamps at Reading had been settled, and that we should not have had occasion to recur to it; but a letter from Mr. Rogers, the clerk of the Local Board, compels us again to notice the subject. Mr. Rogers asserts that "the use of the meters is at present sus-"pended, *solely* on account of the alterations which are being "made at the company's works." Had he said that the use of meters is suspended in consequence of their destruction, either by the impure gas supplied by the company, or by the manner in which they were fixed, or by the temperature to which they were subjected during last summer in the lamp-posts, there might have been some foundation for such statements; but to attribute the suspension of the use of meters solely to the alterations which are being made in the gas company's works evinces a hardihood of assertion for which we were unprepared, even from the clerk of the Local Board of Reading. We have seen specimens of the leather diaphragms of the meters removed from the lamp-posts which will scarcely hang together, so entirely is the texture of the material destroyed—it being, in fact, more like tinder than leather—and through which the gas passed without giving motion to the mechanism of the index. No sufficient explanation of the cause of this destruction of the leather has yet been given; and the mystery is rendered the more inexplicable from the fact that scores of meters, made with similar materials and at the same time, are continuing to work satisfactorily. The manufacturers, indeed, assure us that they have not received a single complaint respecting any one of those meters except from Reading. We recently noticed that, when Mr. Rogers was applied to by the clerk of the local board at Salisbury for particulars respecting the experiment of the average meter system in Reading, he gave a glowing account of its progress—representing the experiment to be working most satisfactorily at the very time that the variations in the registrations of the meters ranged from 150 to 500 feet, and any approximation by such indications to a correct estimate of the quantity of gas consumed seemed hopeless. His present assertion that the use of meters has been suspended *solely* on account of alterations at the gas-works—though he must be aware that the attempt to determine the consumption of gas in the street-lamps by the average indication of thirty-five meters had entirely failed—affords additional evidence of the reliance to be placed on his statements relative to the public lighting of Reading.

In consequence of having received numerous applications for information respecting Siemens's regenerative gas-furnace, we have made inquiries in all places where we have heard that it is used for heating gas-retorts, and the results of our inquiries are not favourable. We explained the nature of the action of this furnace in Vol. xi. of the JOURNAL, pp. 489 and 493, when noticing a lecture delivered on the subject by Professor Faraday, and we stated that the gas-furnace was then

being applied experimentally at two of the metropolitan gas-works. Those experiments were conducted at the Westminster station and at the Goswell Street station of the Chartered Company. At the former, the experiments were continued for about twelve months, but the result was not sufficiently satisfactory to justify their further continuance; at Goswell Street station the experiment still lingers, with no advantage commensurate with the great expenses incurred in establishing the apparatus. At the Paris Gas-Works, also, the experiment has been tried—at first with a single furnace, and afterwards on a larger scale. With a single furnace, applied to the heating of eight retorts, the result was promising, but, on an enlarged application of the system, it failed to realize the expected advantages, notwithstanding the most persevering efforts were made for its success under the direction of the inventor himself. In the application of the heating power of the furnace to an ordinarily-constructed bench of seven retorts, an additional retort can be placed in the space usually occupied by the furnaces; and it was found that the eight retorts could be heated with the gas-furnace for nearly the same cost as seven with solid fuel, but the expense of constructing the apparatus is considered more than equivalent to that advantage. The gas-furnaces erected at the Paris works continue to be used, and efforts are still making to economize the working, but there seems small prospect of eventual success. We mentioned, at the time the gas-furnace was first noticed in our columns, that the principle on which it is constructed consists in converting the fuel employed into carbonic oxide, by maintaining it, when in an incandescent state, in contact with that portion of the oxygen required for its combustion, and then burning the gas thus formed by the further admission of air into the heating-chamber of the furnace. In addition to the estimated economy of this mode of applying the heating power of fuel, it was stated by Professor Faraday to possess great advantages in the cleanliness of the process, and in the facility with which the heat can be managed. It does not appear from the accounts we have received of the practical application of the furnace to the heating of retorts, that advantage was taken of the power of regulating the heat. We hope to be able to publish a detailed account of the experiments that have been made, so that the merits of the invention and its drawbacks may be better understood. In the present state of our knowledge of the subject, it appears that, unless some further improvements be made in the apparatus, it is not economically applicable to the heating of gas-retorts.

In the list of subjects recently announced, for which premiums are offered by the Society of Arts, there are nine connected with the manufacture and combustion of gas and its products; and we hope the stimulus thus given to research in those directions will be productive of useful results. Three of the proposed subjects relate to the application of gas products to dying, comprising premiums, "For a means of fixing upon "cotton and other fabrics all the ordinary aniline colours;" "For a practical process for converting the naphthaline of gas-"works into alizarine, or madder red;" and "For the ma-"nufacture of green dyes from coal or wood tar." A premium is offered for, "An account of the methods at present in use in "the various coal-mining districts for ventilating and lighting "the mines, with suggestions for their improvement;" also for, "The best account of the structure and application of "regenerative furnaces to manufacturing purposes." Inventive genius is stimulated to devise "a system for lighting railway-"carriages with gas, each carriage to have an independent "supply equal to the duration of the oil-lamps now carried, "and the system to be adaptable to existing carriages;" also to concoct "an elastic material for tubing suited to the con-"veyance of gas." A premium is offered, "For the discovery "of a practical means of utilizing naphthaline;" and for the attainment of the long-desired object of contriving "a more "economical process of obtaining oxygen gas than in present "use," one of the Society's medals will also be awarded.

In our notice of the proposed subway scheme of the Metropolitan Board of Works there were a few errors of locality that it may be desirable to correct. The explosion of gas which killed one of the workmen of the Phœnix Gas Company, and seriously injured another, occurred in a private subway at Greenwich, and not in the longer subway in Southwark, in which the Phœnix company have not yet fixed any main; and the other explosions of gas mentioned took place in sewers in the Strand and at Clerkenwell, and not in the subway near Covent Garden.

Correspondence.

IGNITION OF GAS BY LIGHTNING.

SIR,—During the violent storm which took place here last evening, while our lighters were lighting their lamps, the singular occurrence took place of one of the lamp-flames at Fenton becoming ignited by the electric fluid. The lighter had opened the lantern-door, and turned on the gas-cock, when, at that instant, a flash of lightning set fire to the burner, and saved him the trouble of lighting a match for the purpose. ALFRED YOUNG, Manager.

Stoke, Fenton, and Longton Gas Offices,
Dec. 4, 1863.

BRITISH ASSOCIATION OF GAS MANAGERS.

SIR,—Whether you are aware of a society now forming, headed "British Association of Gas Managers," I know not.

The next issue of your valuable JOURNAL appearing before *their* first annual meeting, allow me to suggest, through you, one or two points which I think necessary for carrying out fully and adequately, with advantage to themselves, the views they have to some extent laid down. It would be much better to adjourn the meeting for "six months," which should be the set time (May or June) for the annual meeting. The reasons are obvious. What country manager can, or what right has he to leave important duties, at the *very* time mostly required of him? whereas, in May, he has passed the ordeal of another winter, with all its bickerings and trials—giving him time, and enabling him to brace and prepare his past experience and *future views* to some practical purpose. Again, those who can glean anything from their fellow-members, would be giving *them*, also, time to carry out any new suggestion or idea before the coming winter season.

The annual meeting should not be held twice in one town in any period of *five years*.

Lastly, what is to be the qualification for membership? Must it really be the Great Mogul, no matter what his practical knowledge or length of time connected with the *gas* world? or will, as I should wish, the membership be extended to a few who have advantages in obtaining *practical* as well as *theoretical* knowledge of the business, and are quite as likely to be useful members as the *managers only* of this or that *double-bedded* retort gas-work—I mean the various superintendents and sub-managers of our largest gas-works, whose position is, in every respect, equal to those few who now belong to the "British Association of Gas Managers?"

In conclusion, sir, I am only desirous of seeing, in your last issue for this year, a full report of the above meeting, and hope that something has been done to clear the way for a society, based upon a stronghold, such as will not necessitate the formation of an independent society.

OVERLOOKER IN THE COUNTRY.

Dec. 9, 1863.

Register of New Patents.

1338.—GEORGE GORE, of Birmingham, consulting chemist, for "*Improvements in gas-burners and in gas-furnaces.*" Patent dated May 28, 1863.

These improvements in gas-burners consist in constructing them in the following manner:—A circular disc is formed, of sheet copper, of a diameter equal to about the height of the burner to be made, and having a hole in its middle a little less than the diameter of the finished burner. A series of radial corrugations are made in the disc, by making which the metal is gathered up round the central opening. In this way, there is given to the corrugated disc the general figure externally of a cylinder, the lower end of the cylinder being plain or tube-like; a series of corrugations setting in from the said plain end, and gradually deepening towards the other end, where some of them approach very near, as almost to touch each other, in the axis of the cylinder.

The corrugated cylinder is fixed on an open tube of brass or other metal, to form the complete burner; and, by means of a stop-cock, inflammable gas is admitted near the bottom of the said tube. The gas, in rising, mixes with air, and the mixture issues from the top of the burner, in the form of a series of radial jets, where it is ignited. Atmospheric air ascends in the radial spaces between those through which the gas rises, and there is thus produced alternate jets of air and a mixture of air and gas. The gas rises in those portions of the corrugations which open outside the cylinder into the atmosphere. The combustion of combustible gas by means of a burner of the kind described produces a very intense heat. Although the above radial arrangement is preferred, the patentee does not limit himself thereto, as the parts of the burners may be so arranged that the alternating sheets of the combustible gaseous mixture and atmospheric air may be either parallel or in concentric circles.

The improvements in gas-furnaces are as follows:—The burner above described, or some other burner, is fixed at the bottom of a vertical tube of fire-clay, which is bulbous externally at top, and has in the lower part of the bulbous portion projections on which a crucible can rest. The said tube of fire-clay is supported in the axis of a vertical hollow cylinder of sheet iron lined with fire-clay. The said cylinder is fixed upon a sheet-iron disc, through which the top of the burner projects slightly, and into the tube of fire-clay. The said cylinder is closed at top by a fire-clay slab having a central opening closed by a ring and plug. A chimney opens into the side of the cylinder near its bottom, and extends upwards about five feet or more, according to the draught required. When the gas is ignited, the flame ascends within the tube of fire-clay, heating the

crucible supported at its upper part. The flame then descends outside the said tube, and the products of combustion pass off by the chimney. The contents of the crucible may be inspected by removing the plug at the top of the furnace; and by the removal of the ring in which the plug fits, the crucible may be introduced into or removed from the furnace. In large furnaces, one large burner or a series of small burners may be employed.

The claim is for the improvements in gas-burners hereinbefore described—that is to say, the constructing gas-burners substantially in the several ways described, whereby alternating radial sheets of atmospheric air, and a mixture of gas and atmospheric air, or alternate parallel or concentric sheets of atmospheric air, and the said gaseous mixture, are delivered at the top of the said burners.

1405.—William Clark, of 53, Chancery Lane, London, engineer, for "*Improvements in the distillation and separation of hydrocarburets and their derivatives, and in apparatuses for the same.*" A communication. Patent dated June 5, 1863.

It is found, in the various methods of treating mixed hydrocarburets for obtaining colouring matters therefrom, that the result differs according as they contain a greater or less quantity of heavy oils; also, that the amount of colouring matter greatly varies, while the latter does not always furnish the same tinctorial products. It is also found, when operating upon pure products, obtained at great expense in a laboratory, that each of the hydrocarburets contained in these oils possesses peculiar properties, and should, in order to obtain good results, be treated separately and in a different manner.

The object of this invention is thus to find a practical means of separating the hydrocarburets so as to obtain manufacturing products containing 95 per cent. of pure matters, for the purpose of obtaining the same result with a considerably less number of them, the object being to maintain the temperature at a certain point, in a certain number of superposed plates, heated one by the other, which is necessary in order to effect the distillation of hydrocarburets the boiling-point of which is above 215° Fahr. In this case, the apparatus is furnished with a bath, containing a separated worm-plate, and also a heating worm-plate, the bath being also filled with a liquid the boiling-point of which is above that of water, consisting either of a solution of chloride of calcium or of oil, according as the boiling-point of the hydrocarburets to be separated is more or less elevated, so as to maintain the bath at a necessary temperature by means of a heated worm-tube contained in the said bath. Steam is used for heating the hydrocarburets the boiling-point of which is below 275° Fahr., while for those requiring higher pressure superheated steam is employed.

The claim is for the improved method of separating all kinds of mixed hydrocarburets and their derivatives, as described, whereby all the units contained in the many complex hydrocarburets—such as petroleum, schist, and others—are separated in a single operation, so as to obtain direct, without increase of cost, either pure hydrocarburets or pure derivatives therefrom—aniline being derived from benzine, toluidine from toluine, which are pure products hitherto unknown in commerce.

Secondly, the application of a rectifying column, such as that described, or any analogous thereto, for effecting the separation of the hydrocarburets, as hereinbefore described.

1410.—Charles Edward Newcomen, of 20, Ovington Square, Brompton, in the co. of Middlesex, for "*Improvements in the treatment of peat and other substances containing moisture.*" Patent dated June 8, 1863.

This invention relates to the treatment of peat or other substances containing moisture, for the purpose of rapidly and effectively depriving them of the moisture therein contained; and consists essentially in subjecting such substances to the action of vacuum and heat—the heat tending to vapourize the moisture, whilst the vacuum facilitates or assists the escape of such moisture from the interior of the mass of the substance under treatment.

In carrying this invention into practice, the peat or other substance from which the moisture is to be expelled is placed in an air-tight vessel or receiver, which is in direct communication, by means of an exhaust-pipe, with an air-pump or pumps, and is provided with a vacuum-gauge, thermometer, and peep-holes, covered with glass or talc, so that the amount of vacuum, the degree of heat, and the progress of the operation, may be readily ascertained. The vessel or receiver is heated generally either by means of a fire, or hot air applied externally, or by steam—in which case, a steam or hot-air jacket may surround or partially surround the vessel or receiver; or, if preferred, heating-pipes in the form of coils or otherwise may be disposed inside the receiver or vessel; or any other convenient method may be adopted for heating the same. If desired, a branch-pipe may be fitted into the exhaust-pipe, and led into a condensing-vessel or chamber; or an ordinary condensing-worm may be employed—the object being to condense the watery vapour as fast as it is extracted from the vessel or receiver. Any water which may collect inside the vessel may be withdrawn, without interfering with the vacuum, by means of a syphon-tube or pump, or other analogous arrangement. The temperature employed in drying the peat, it is found in practice, should not exceed about 400° Fahr., any excess of such temperature tending to cake and crack the surface of the peat, which is objectionable. Amongst other substances which may be dried in the same manner are mentioned bricks and pottery articles generally composed of plastic, clay, or earthy matters.

1435.—Richard Archibald Brooman, of 166, Fleet Street, in the City of London, for "*Improvements in the distillation of bituminous substances.*" A communication. Provisional protection only obtained. Dated June 9, 1863.

This invention consists in the distillation of bituminous substances by means of heated gases applied directly to such substances.

1435.—Henry Martin, of Surrey Square, Old Kent Road, land agent, for "*Improvements in treating and preparing night-soil and sewage with other materials as a manure.*" Provisional protection only obtained. Dated June 9, 1863.

This invention consists in the application of charred tan, charred hop-bines, charred bean-stalks, and other vegetable material, for deodorizing and solidifying sewage, night-soil, and other offensive matters, and converting the same into manure. Night-soil is used in about equal proportions with the charred material above mentioned, while solid matters of sewage take up about a like proportion, the water separating and passing away clear.

1445.—William Wells, engineer, and John William Myers, pattern maker, both of Manchester, Lancashire, for "*Improvements in apparatus for obtaining artificial light from volatile liquids or fluids.*" Patent dated June 10, 1863.

The nature of this invention consists in the application of the rarefied air, generated by the aid of the light to be produced for creating a current of air, which is made to pass through or in contact with a vessel filled with yarn or other fibrous or porous substance. This substance is constantly kept moist with the spirit of petroleum or other volatile liquid, supplied by means of capillary attraction from a receiving vessel containing the same. The rarefied air in passing through the vessel filled with yarn or other fibrous or porous substance absorbs and mixes with a portion of the volatile liquid, and forms an inflammable gas for the production of artificial light; or the volatile liquid may be volatilized by the application of external heat.

The burner is placed at the under side of the vessel, and above the light is placed a funnel communicating with the upper end of the vessel. By this arrangement, the air, rarefied by the light, ascends the funnel and enters the upper part of the funnel, where, as before stated, it mixes with the gas or vapour given off by the volatile liquid held in the yarn or other fibrous or porous substance, and in that state passes through the pipe to the burner.

The claim for improvements in the production of artificial light from volatile liquids or fluids is the application of the air, heated and rarefied by the flame of the burner, to the interior or exterior of the vessel containing the liquid or fluid to be volatilized in the manner described.

APPLICATIONS FOR LETTERS PATENT.

2981.—Frederick Page, of Birmingham, bank accountant, for "*Improvements in furnaces and apparatus for the manufacture of volatile hydrocarbons, which improvements are also in part applicable to furnaces and apparatus for the manufacture of illuminating gas.*" Nov. 27, 1863.

2991.—Charles Cordon, of Nottingham, plumber, for "*Improvements in means, or apparatus for supplying water to water-closets and urinals.*" Nov. 28, 1863.

3003.—Charles Pontifex, of St. Paul's Road, Islington, and of Shoe Lane, Holborn, London, for "*Improvements in the construction of sluice and other cocks or valves, and in the means of connecting them and the ends of flexible hose-pipes together.*" Nov. 30, 1863.

3015.—William Clark, of 53, Chancery Lane, London, for "*Improvements in apparatus for lighting and heating.*" [A communication. Dec. 1, 1863.

3017.—George Glover, of the Ranelagh Works, Ranelagh Road, Pimlico, London, for "*Improvements in dry gas-meters.*" Dec. 1, 1863.

3023.—William Wilson, of Manchester, ironmonger, for "*Improvements in generating gas for illuminating and other purposes, when made by passing atmospheric air over or through volatile oils, and treating such gas, and the gas made from coal or cannel, after leaving the generators, so as to improve the heating and illuminating qualities thereof, and in the apparatus for effecting the same.*" Dec. 2, 1863.

3029.—Henry Holdredge, engineer, of Irvington, New York, U.S.A., for "*Improvements in the process and manner of making gas for illuminating, heating, and other purposes, a part of which may also be applied to the production of metallic oxides.*" A communication. Dec. 2, 1863.

3033.—Joseph Cutler, of Gloucester Road, Upper Holloway, London, for "*Improvements in apparatus for lighting and ventilating.*" Dec. 2, 1863.

3037.—Richard Archibald Brooman, of 166, Fleet Street, London, for "*Improvements in the distillation or treatment of bituminous substances.*" A communication. Dec. 2, 1863.

3042.—David Hulett, of High Holborn, London, gas engineer, for "*Improvements in gas-stoves for heating irons and other purposes, and in the construction of irons to be heated and used therewith.*" Dec. 3, 1863.

3046.—John Robbins, of 372, Oxford Street, operative chemist, for "*Improved methods of obtaining oxygen gas.*" Dec. 4, 1863.

3057.—William Gorman and John Paton, of Glasgow, N.B., for "*Improvements in obtaining and applying heat and in apparatus therefor, being also in part applicable for lighting.*" Dec. 5, 1863.

3096.—Michael Henry, of 84, Fleet Street, London, for "*Improvements in apparatus for regulating the passage of aeriform and other fluids.*" Dec. 8, 1863.

GRANTS OF PROVISIONAL PROTECTION.

2383.—John Bailey, turret clock manufacturer, Salford, George William Blake, agent, of Manchester, and William Henry Bailey, turret clock manufacturer, Salford, for "*Improvements in barometers, gas-regulators and other apparatuses for regulating and indicating the flow and pressure of liquids and fluids.*" Sept. 28, 1863.

2716.—John Macintosh, of North Bank, Regent's Park, London, for "*Improvements in taps or cocks for liquids or gases.*" Nov. 3, 1863.

2812.—Andrew Craig, of Rock Ferry, Birkenhead, engineer, for "*Improvements in distilling hydrocarbons from coal, shale, and other bituminous substances, and in apparatus employed for that purpose.*" Nov. 12, 1863.

2835.—George Kennedy Geyelin, civil engineer, of 17, King Street, Cheapside, London, for "*Improvements in the construction of water-closets.*" Nov. 13, 1863.

2878.—William Cowan, of Edinburgh, N.B., gas-meter manufacturer, for "*Improvements in gas-meters.*" Nov. 17, 1863.

2886.—William Mattieu Williams, of Oak Alyn, near Wrexham, in the co. of Denbigh, manufacturer, for "*Improvements in apparatus for the distillation of coal and peat, and such other substances as are, or may be, used for the manufacture of solid and liquid volatile hydrocarbons, or for the manufacture of the said hydrocarbons and coke.*" Nov. 18, 1863.

2912.—George Rait, of Canal Bridge, Kingsland Road, managing director of the Gas-Meter Company, and John Winsborrow, of 23, Castle Terrace, Pownal Road, Dalston, foreman of the said company, both of London, for "*Improvements in the construction of dry gas-meters, and in the means or apparatus employed therein.*" Nov. 20, 1863.

2924.—William Edward Newton, of 66, Chancery Lane, London, civil engineer, for "*Improvements in the construction of fan-blowers for ventilating and other purposes.*" A communication. Nov. 20, 1863.

2963.—George Parkin, of Tryddyn, in the co. of Flint, engineer, for "*Improvements in apparatus employed in the manufacture of paraffin, and other like oils, from shale, cannel, and other minerals.*" Nov. 25, 1863.

2968.—John Hays Wilson, of Liverpool, brassfounder and ship's ironmonger, for "*Improvements applicable to ships and other lift-pumps.*" Nov. 25, 1863.

2971.—Richard Laming, of Priory Road, Kilburn, West Hampstead, Middlesex, for "*Improvements in preparing materials useful in the purifying of gas from sulphuretted hydrogen, carbonic acid, and ammonia, and in making ammoniacal compounds.*" Nov. 26, 1863.

2973.—James Simmonds, of Holland Street, Clapham Road, London, plumber, for "*Improvements in stink-traps for water-closets, sinks, and other purposes.*" Nov. 26, 1863.

2975.—Jean Nadal, of 14, Brooke's Market, Brooke Street, Holborn, London, for "*Improvements in apparatus for raising and forcing fluids.*" Nov. 26, 1863.

2981.—Frederick Page, of Birmingham, bank accountant, for "*Improvements in furnaces, and apparatus for the manufacture of volatile hydrocarbons, which improvements are also in part applicable to furnaces and apparatus for the manufacture of illuminating gas.*" Nov. 27, 1863.

2991.—Charles Cordon, of Nottingham, plumber, for "*Improvements in means, or apparatus for supplying water to water-closets and urinals.*"

3003.—Charles Pontifex, of St. Paul's Road, Islington, and of Shoe Lane, Holborn, for "*Improvements in the construction of sluice and other cocks or valves, and in the means of connecting them and the ends of flexible hose-pipes together.*" Nov. 30, 1863.

3015.—William Clark, of 53, Chancery Lane, London, for "*Improvements in apparatus for lighting and heating.*" A communication. Dec. 1, 1863.

3017.—George Glover, of the Ranelagh Works, Ranelagh Road, Pimlico, London, for "*Improvements in dry gas-meters*" Dec. 1, 1863.

3023.—William Wilson, of Manchester, ironmonger, for "*Improvements in generating gas for illuminating and other purposes, when made by passing atmospheric air over or through volatile oils, and treating such gas, and the gas made from coal or cannel, after leaving the generators, so as to improve the heating and illuminating qualities thereof, and in the apparatus for effecting the same.*" Dec. 2, 1863.

3033.—Joseph Cutler, of Gloucester Road, Upper Holloway, London, for "*Improvements in apparatus for lighting and ventilating.*" Dec. 2. 1863.

NOTICES TO PROCEED.

1825.—Edward Thomas Bainbridge, of St. Paul's Church Yard, London, for "*Improvements in ventilators.*" July 21, 1863.

1893.—George Sigl, of Vienna, engineer, for "*Improvements in the construction of force-pumps.*"

1921.—George Stevens, of Malvern Cottages, Portland Place, North Clapham Road, for "*Improvements in means, or apparatus for effecting a regular supply of air or aëriform fluids for various purposes.*" Aug. 4, 1863.

2745.—Sydney Smith, of Hyson Green Brass Works, near Nottingham, for "*Improvements in safety-valves for steam-boilers, and in valves and taps for regulating the flow of fluids.*" Nov. 5, 1863.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

2882.—William Renwick Bowditch, "*Improvements in the purification of coal-gas and of coal-oils.*" Nov. 24, 1860.

2916.—John Robb, "*Improvements in gas-stoves.*" Nov. 28, 1860.

2941.—Edward Thomas Hughes, "*Improvements in the manufacture of metal tubes.*" Nov. 30, 1860.

2958.—Richard Edward Keen, "*Improvements in cocks, taps, valves, and other apparatus for stopping and regulating the flow of liquids, steam, and gas.*" Dec. 3, 1860.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

2788.—Charles Edwin Heinke, "*Improved apparatus for illuminating objects beneath the surface of water, or for giving light in mines and other places where combustible or explosive gases exist.*" Nov. 24, 1856.

2824.—Charles William Siemens, "*Improvements in fluid meters.*" Nov. 29, 1856.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

City Court of Sewers, Guildhall, Tuesday, Dec. 1.

At the Meeting of the Commissioners this day—Deputy De Jersey in the chair—the General Purposes Committee, to whom the questions in respect of the supply to the City have, from time to time, been referred, reported that they had their attention drawn to the circumstance that the existing arrangements with the gas companies for supplying gas to the public lamps would expire on the 31st of January next; as also would the agreement with the Carburating Company for the use of their patent; and with Mr. Sheen, for the supply of naphtha and other works in connexion with the carburetting process applied to the lamps lighted with gas supplied by the Great Central Gas Consumers Company. They, therefore, directed that the clerk be instructed to write to the three gas companies supplying gas to the City for proposals of the terms on which they were disposed to continue the supply for the term of one year from the 1st of February, 1864, to the 31st of January, 1865, both inclusive; and that the commissioners should receive such proposals on Tuesday, the 15th of December instant. They also reported that they had arranged with the Carburating Company to pay to them the same royalty as at present—viz., 6s. per lamp per annum, but to be subject to a reducion for repairing and renewing the carburators at the sum actually expended thereon, but not to exceed 1s. per lamp per annum. They stated, also, that they had directed the surveyor to arrange with Mr. Sheen for the execution of his work as heretofore, on the best terms he could, so that a reasonable reduction were made by him. They had also directed the surveyor to obtain sufficient standard lamps of the new pattern, to be set up as soon as possible in the line of street from Temple Bar to St. Paul's Churchyard, inclusive.

The report was received and adopted.

Dr. Letheby reported that, during the past week, the illuminating power of the gas supplied to the City had been above the requirements of the Act of Parliament; but the chemical quality of the gas, as regards the amount of sulphur, was, in the case of the City and Chartered Companies, above the proportion sanctioned by Parliament. The average amount in the Chartered gas was 26 grains per 100 feet.

Deputy Farrar asked what had been done in reference to the former reports of the medical officer, which had been sent to the committee.

The Chairman said the committee had a conference on the previous day with the chairmen of the three companies supplying gas to the City, on the subject of the excessive amount of sulphur in their gas. They stated that they had done all they could to prevent it, and seemed to throw the blame upon the coals used. They had promised to consult an eminent engineer on the question, and the committee were to see them again as soon as they had obtained his report.

Deputy Perkins said the medical officer was accustomed to furnish a statement every week of the illuminating power of the gas, and he should like to ask that gentleman whether he possessed any record of the pressure. There was great complaint in the City, that the pressure on the gas supplied to the street lamps was very insufficient, and that scarcely any light could be procured from them. In his own ward, in places where the lamps were required to prevent nuisances, they burned with such a yellow flame that, practically speaking, they were of little use. Happening a short time before to go to a place of entertainment in the City Road, he found that the lamps in that district contrasted very favourably with those in the City itself, and he attributed this fact to a much better pressure on the mains there.

Dr. Letheby said he had nothing to complain of on the score of pressure. The register which he kept showed that the average, in the case of the City Gas Company, was 1½ inch; in the Chartered, 1$\frac{7}{10}$; and in the Great Central, 1$\frac{4}{10}$; and he could not help thinking that that was a pressure sufficient for all purposes. It was very probable that, in the instances referred to by the deputy, the deficient pressure arose from obstructions in the pipes and fittings of the houses, which to a great extent interfered with the flow of gas to the burners. Parliament had not thought it necessary to lay down any rule in regard to the pressure at which gas should be supplied. The subject was discussed in the committee of the House of Commons, and it was decided that there would be ample protection given to the public if regulations were enacted in respect to the purity and illuminating power, because it was felt that it was to the interest of the gas companies to make the consumers burn as much gas as possible, and therefore to give as great a pressure as could, with advantage, be made available. The pressure register which he kept, and which was continually in operation, showed that the pressure had ranged from 1 inch to nearly 3 inches, the average being 1½ inch, which, as he observed before, was sufficient for all purposes. Here and there, at low levels, the pressure might be under the average; but the great cause of want of light was the deposition of naphthaline and other things in the pipes, which prevented the full benefit of the pressure being obtained. If the commission were to call upon the companies to give a greater pressure, the leakage in the streets, from cracks and fissures in the pipes, would entail upon the companies an enormous loss.

Deputy Burnell said the result of that might be to induce the companies to improve the condition of their mains.

Deputy Farrar asked whether the companies could not remove the deposits of naphthaline from their mains.

Dr. Letheby said the deposits were principally in the pipes of the consumers, and the consumers had the remedy in their own hands, for as soon as they found that they could not get pressure sufficient, they had only to inform the companies, who would send a man with an instrument to blow the fittings out.

Deputy Farrar: Are the companies bound to do so?

Dr. Letheby: I do not know that they are bound to do so; but they do it.

Deputy Farrar: Is it to the interest of the companies to give a sufficient pressure to the private consumers and the public lamps?

Dr. Letheby: It is clearly to their interest in every case. Of course, if they were under contract they would regulate it accordingly, but it is not their interest to give an excessive pressure, because of the great increase it would cause in the leakage. I believe, at the present time, it is one quarter of the gas they send out.

Deputy Burnell: Is it not possible that the pressure should be so great that the gas is delivered to the burners faster than it can be consumed, and that a portion is, therefore, improperly used or wasted?

Dr. Letheby: No doubt it is. And there is another thing which I may mention: we are finding fault with the pressure at which the gas is supplied, and yet I will undertake to say that a very large proportion of the burners in private houses are positively fitted up with an apparatus to reduce that pressure—what is called Hart's economizing burner. We are

finding fault with the pressure, and the consumers are actually putting on an instrument for the purpose of lowering it.

Deputy PERKINS said his complaint was not in respect of the private lights, but the public lamps. He found that when he first lighted the gas in his own room there was little or no pressure, but as the shops began to be lighted up, the pressure so increased that he was obliged to turn down his gas, so that there was evidently, then, too much pressure. But after seven or eight o'clock, when the shop-lights were put out, the pressure on the gas at the street-lamps became very feeble.

The CHAIRMAN said the companies no doubt regulated the pressure according to the consumption.

Deputy FARRAR asked whether Hart's burners were supplied to any of the public lamps.

Dr. LETHEBY said they were not.

Deputy FARRAR agreed in what had been said as to the want of pressure in the case of the street-lamps. He asked who had charge of the lighting of those lamps.

Mr. HAYWOOD: The gas companies.

Deputy FARRAR: And does not a great deal depend upon how the taps are turned on?

Dr. LETHEBY: No doubt. We shall have to light and put out the lamps ourselves, by and by.

Deputy BURNELL asked whether any of the City gas companies had adopted a graduated scale of charges for gas, or whether they uniformly charged 4s. 6d. He had reason to know that some of the surrounding companies were lowering their tariff when the gas was supplied in large quantities.

The CHAIRMAN said he was not aware that such was the case in the City.

Deputy FARRAR said there were two prices charged in his neighbourhood. The companies said that they supplied a better article—cannel gas—for the higher price.

The report was then referred to the committee.

TUESDAY, DEC. 8.

Dr. LETHEBY reported that during the previous week the illuminating power of the gas in each case had been equal to the requirement of the Act of Parliament, the average for the week being—for the City gas, 14·4 standard candles; Chartered gas, 13·47 candles; and the Great Central gas, 13·45 candles. Except in the case of the Chartered Company, the average proportion of sulphur in the gas was less than that sanctioned by Parliament. In the case of the Chartered gas, the range was from 17·2 grains in the 100 cubic feet to 25·3 grains, the average being 21·6 grains.

Mr. H. L. TAYLOR asked if anything had been done with regard to the prosecution of the gas companies for not supplying the City with proper gas.

The CHAIRMAN: We have had a conference with the companies, and they are to consult an eminent engineer, after which we are to hear from them again.

Mr. H. L. TAYLOR: We are not going to lose sight of the matter, I hope. I am looking forward to £20 a day penalties.

The CHAIRMAN: It will not be lost sight of.

The report was referred to the committee.

METROPOLITAN BOARD OF WORKS.

TUESDAY, DEC. 1.

A Special Meeting of the above Board was held this day—Mr. THWAITES in the chair—to consider the various tenders for a concession of the sewage of the metropolis, and to pass such orders thereon as might be deemed desirable.

The CLERK read a letter containing a resolution of the vestry of St. James's, Westminster, urging upon the board to delay granting any concession of the sewage to Lord Torrington and his partners, until further opportunity for inquiry into the plans of Mr. Ellis and others had been afforded.

The CHAIRMAN said they were met to discuss the merits or demerits of the several propositions before them. A great deal had been said out of doors, which they must entirely disregard; and they must direct their attention exclusively to the merits of the several plans. As far as he was concerned, he could conscientiously say, as most of them were aware, that he had gone into the several plans with the greatest care and attention, and none of them satisfied his mind. He most certainly had no prejudice in favour of any particular plan, but all that he had seen failed to give that amount of information which he thought the board should be in possession of before they dealt with the important question of the sewage. It might happen that they had discussed this matter, and would see some propriety in referring it to the Main Drainage Committee to have an interview with the parties, agreeable to the advertisement issued, in order to enable them to judge more of the detail which the parties proposed to carry out, and where the land was situated upon which they proposed to operate; because it must ever be remembered that the board would be responsible for any nuisance that might be created. It was, therefore, of the first importance that they should be clear upon all points of detail, not only in reference to royalty that the parties might propose to give to the Board of Works, but as to how they would apply it, so that the Board of Works might be sure that no nuisance would be created. It occurred to him that such an investigation must precede the question as to whom the concession should be granted. That, of course, was a matter which would be discussed and examined; and he was quite sure that every member of the board would come to that question as free from prejudice as he was himself, only being desirous of obtaining the best plan by which the sewage could be utilized, and the interest of the ratepayers promoted. He hoped, therefore, that no indiscretion on the part of any of the parties connected with any proposal would damage their position, but that they would consider every proposal upon its merits. There were suggestions in several tenders which were worth the very serious attention of the board, and he hoped that ultimately they might arrive at such a conclusion as would secure the attainment of the object to which he referred.

The CLERK OF THE BOARD then read the advertisement inviting the tenders, and the report of the committee of the whole board of the 9th of July last, which has already appeared in this JOURNAL.

Mr. CARPMAEL: Are you aware, sir, whether any of these parties have gone to Parliament?

The CHAIRMAN: I do not think any have, as far as I am able to judge.

The CLERK OF THE BOARD said he had received a letter from Mr. Greenwood, the vestry-clerk of St. Marylebone, enclosing the following resolution—"Resolved that this vestry regards the utilization and profitable employment of the sewage of the metropolis as a matter of primary importance to the interests of the ratepayers."

Mr. RICHARDSON moved the following resolution—"That none of the tenders received are sufficiently explicit now to warrant their acceptance; and the board, therefore, refer them to the Main Drainage Committee with a view of obtaining such further information as the several tenderers may be prepared to offer." In supporting the resolution, Mr. Richardson said that, although he was no enthusiast, and had already made known his views upon the question, he had very strong views as to the beneficial advantages which were likely to arise from the application of the sewage of the metropolis to the irrigation of land. His own views ran in the direction which had been portrayed by the schemes before them, as represented both by Mr. Ellis and Lord Torrington. He thought that it was by the application of the sewage to large surfaces of land—by that alone the benefit would be obtained; and he did think that when they gave a little consideration to the matter, they would find that that was the only course that could be pursued as opposed to its application to small surfaces of land. He was interested last summer in watching the outfall of the sewage where it emerged into the river. He had always understood, from those who had expressed an opinion upon the subject, that by the disintegration of the solid particles of sewage in passing through the various channels, before it reached the outfall—an immense distance from the metropolis—all the solid particles would have ceased to exist, and that it would have been pure liquid; but he found, and anyone who examined the sewage at the same time must have seen also, that there were very large quantities of sewage passing out into the river almost as solid as when it entered the sewer. That fact rather confirmed him in the opinion that the subject divided itself into two questions—first, what should be done with the liquid sewage; and, secondly, what should be done with the solid part of the sewage. It would be found, also, when they looked at the plans which were before them, that some of them proposed to deal solely with the liquid sewage, others proposed to deal solely with the solid sewage; each of them had their respective plans, and were, in his judgment, well worthy the consideration of the board. To deal, in the first place, with the liquid part of the sewage. Last season might be taken as an evidence of that which would well test the application of sewage. What were the characteristics of their last season? They had a magnificent summer, a long period of hot suns and great drought, and what was its result? They found that that season which was so benefical to the cereal crops, so that through the bounty of Providence they had an abundant harvest, was the very season which almost, in some cases, destroyed, and, at all events, injured and retarded the grass and root crops, which were the food for cattle. Thus they found that the bounties of Providence were, to a certain extent, averaged—that is to say, that whilst they had a good harvest, and, as the result, a cheap loaf, the very weather that produced that good harvest brought with it a bad grass crop, a small root crop, and, in consequence, dear meat. It was impossible for him to suppose that, at that advanced stage of civilization, with the mechanical appliances that they had before hand, and the almost unlimited amount of capital that might be obtained, that they might not devise some scheme by which those difficulties might be overcome. He would speak especially with reference to the application of liquid sewage to grass-land and root-crops, and not to arable land. They found, from the evidence that had been given before different commissions, that the application of liquid sewage to grass-land, the sewage being so many degrees warmer than the natural soil, brought forth the first crop earlier than it otherwise would be, and they might then manure again, and get a very large after-feed. What was the state of their fields at the present time, when the hay had been carried? They were brown and dry, and were not able to carry any stock upon them until late in the autumn, if they had weather favourable to the growth of the cereals; whereas, if they had a wet season, they had a good after-feed, and then a bad cereal crop. They should, therefore, adopt some means of providing against either contingency, and to provide themselves with that which would give them not only cheap bread but cheap meat. They were destroying, at the present moment, millions of tons per day of that which would meet this evil. Marsh lands had liquid enough to supply them through the summer season; it was the high lands that wanted the irrigating system applied to them; and, if they had the means applied by proper engineering schemes—whether by pumping direct, or by pumping into a reservoir—they would by that means secure a very great blessing to the whole community at large. He looked upon the scheme as one of national consideration. It was, no doubt, remarked how little cattle the land would carry at the present moment; but it was clear, if they could secure to the farmer his grass crops and his root crop, never mind what sort of a season there might be, the land would carry twice as much stock as it now did; and if it carried twice as much stock, what would be the result? The farmer would be benefited, the landowner would be benefited, and the consumer would be benefited, because he would get a cheaper article. This would solve the riddle to benefit at one and at the same time the landowner, the farmer, and the public at large. A witness before the House of Commons had asserted that 50 acres of land was raised in value from £2 to £5 an acre merely by the application of sewage from his own house. He (Mr. Richardson) did not wish to deal with so large a benefit to be derived as £5 an acre, as some might think that that was an outside sum, though other persons said it was otherwise. But let the land be only benefited to the extent of £1 per acre—and what did £1 per acre represent in the fee-simple land?—surely they might take it at 25 or 30 years purchase. Then came the question as to what would be the cost of applying this system on to the various grass lands. From the evidence that he read, the cost appeared to be £5 an acre for the utilization of the sewage in the way proposed by the irrigation of grass lands generally; therefore, that did not seem, when they came to look at it, to be attended with an great impracticability, and it could not be said it was impossible to apply it because of the enormous expense that would have to be incurred. It was a question that must be gone into by degrees. They must begin by small things, and go on with large ones. A farmer would not be ready to lay down his capital by himself, neither would the landowner; therefore it must be a mutual operation between the one and the other. In many cases there were circumstances which would prevent the working going on immediately; it must, therefore, be a work of growth; but that it would grow was one of the things he felt as certain of as that he was standing there. It seemed to him to be the very course which nature pointed out, that they should return to the soil that which they had taken from it. As to the solid part of the sewage, that should be chemically dealt with in unison with other articles, especially bones; and they must still remember that, when they were returning to the soil the solid particles of the sewage, they were returning only that which they had taken from it. Men consumed the animals, and the animals had deposited upon the earth that which they had already taken out of the earth; but man refused to return to the earth that which was formed from the very consumption of the animal food, and consequently they deprived the earth of very much that was due to it. If, by

chemical arrangement, they could produce, as he submitted could be done, an article that would be fit for the purpose of arable land—and there was the point in which he made the distinction—that whilst liquid sewage was so applicable to grass land or root crops, the solid particles of sewage might be made into a manure that was applicable for the purpose of arable land, and ploughed in to benefit their cereal crops. That seemed the course which nature pointed out. They had the elements of manuring the land all within the country; there was no necessity for purchasing large quantities of manure from abroad; it merely required chemical skill and appliances to use what they had. He was, however, of opinion that there was nothing sufficiently mature in the schemes which had been laid before the board to warrant their support in dealing with them. There were various schemes, but they were mixed up with many other things that were very unsatisfactory, so that it would be perfectly impracticable to entertain either of them. He, therefore, submitted the resolution which he had moved, that all the plans should be referred to the Main Drainage Committee, that the several gentlemen who had put those schemes before them might be referred to the committee, which of course would sit with closed doors, and thus they might have before them much matter of a very serious and important character, which would enable them to arrive at a better conclusion than they could at the present moment.

Mr. BIDGOOD seconded the motion. He said the board required a long time to come to a proper conclusion upon so momentous a question. It required further consideration; and, for a thing which was to be of value for centuries to come to the metropolis and the nation at large, it mattered not whether that consideration extended over one or two years. There could not be a more unwise step taken by the board than to arrive hastily at a conclusion either on one side or the other. He, therefore, did humbly pray and move that the board would not rashly undertake any one of the schemes which were before them. In reference to the parties who had kept the question before the public for some time past, he thought the London public was under a debt of obligation to them. There had been errors, and there had been excesses; but the old story they knew was, that "every man thought his own goose a swan." It might possibly be so; and, without making any reference at all to individuals, it was possible that they took an exaggerated view of the benefits which they proposed to confer. The board, however, had nothing to do with that: let them wait, and see whether they could not, by judicious waiting, have a further development of the question, and whether they could not secure such large advantages for their future ratepayers, even if they did not reap an advantage.

Mr. D'IFFANGER thought the resolution was not sufficiently explicit. They must take every precaution in what they did, so that no evil would arise to the inhabitants of the metropolis with regard to the nuisance. He entirely agreed with all that had been said as to the value of the sewage: the only difficulty was, how to apply it in the best manner. Some plans involved so much cost, that he feared they could not possibly be carried out. They had been spending between three and four millions of money to carry it away from the metropolis, and now some plans proposed to expend almost that sum to bring it back again. The resolution which he proposed was this:—"That, inasmuch as the board are bound by various provisions of the several enactments under which their works are carried on so to conduct them as not to cause a nuisance, and that the profitable employment of sewage under the schemes proposed in the tender may involve its application to the surface of the land on an extensive scale, they cannot be parties to any agreement for such application unless they have clear information on the localities, nature, and extent of the land to be so dealt with, and satisfactory assurance that the processes to be employed are such as not to cause a nuisance; that none of the tenders received being sufficiently clear upon this point, the board, therefore, refer them generally to the Main Drainage Committee, in order to obtain essential and detailed information, and to confer with the several promoters as to other conditions of the advertisements upon which their proposals are neither full nor explicit, and generally to consider as to the utilization of the sewage." He thought they would agree that that would be an explanatory resolution, and more satisfactory than the former one; he, therefore, proposed it as an amendment.

Mr. PHILLIPS, in seconding the amendment, said that there could be no question whatever that, however the sewage was disposed of, if a nuisance were created, the board would be the parties whom the Secretary of State would look upon as responsible. It, therefore, became necessary in dealing with the matter to take care, in the first instance, that no nuisance was created by the manner in which the sewage was applied to the land. There could be no doubt as to the value of the sewage; and everyone must see that, if the board could see far enough to determine as to the application of the sewage, they would be conferring incalculable good, not only upon the metropolitan ratepayers, but on the country at large; for they would be doing that which would, of course, place the poor in a position to get their food cheaper, and they would be benefiting the country, the landlords, the tenants, and the public. He had gone through all the plans very carefully, but he could not see his way clear to carry any of them out. He would recommend that the Main Drainage Committee should have a conference with the parties, and that the parties should before that committee detail certain matters which it was not essentially necessary that the board should be informed of. They might then elicit from those parties something that would show a decided preference for one of the schemes. At present, for his own part, good as some of them were, he could not give a preference to any one of them; and he did hope that if the board accepted the reference to the Main Drainage Committee, based upon the ground of the difficulties arising in the minds of the members of the board in reference to responsibility as regarded any nuisance that might be created by a concession, the Main Drainage Committee would then be in a position to bring up such a report that the board might, with credit to themselves and advantage to the public, come to a determination on that very important scheme.

Mr. NEWTON thought the amendment was preferable to the original proposition. He did not think Mr. Richardson had clearly established the fact that none of the proposals were sufficiently clear to enable them to be adopted. He had not cited any points which were not satisfactory to him; and taking his speech, he (Mr. Newton) should have thought that there were several of those propositions that were satisfactory to him, because his speech was based entirely upon those propositions. He could not controvert the merit of the general assertions made respecting their duty to the earth, seeing that they derived so many advantages from it; but he could not exactly see how they were going to profit by enhancing the value of the land £1 per acre by devoting this sewage to it at an expense of £5 per acre in machinery.

Mr. RICHARDSON: I said it would improve the annual value of the land £1 per acre, at a gross original outlay of £5 per acre.

Mr. NEWTON said the original outlay would be a very small proportion as compared with the working expenses.

The CHAIRMAN said he understood the honourable member to state that, at an outlay for machinery and apparatus for distributing the sewage, of £5 per acre, it would permanently benefit the land to the extent of £1 per annum per acre.

Mr. NEWTON said that, if that was Mr. Richardson's assertion, it was perfectly incomprehensible to him; for, if there was not to be an annual outlay as well as the first outlay, he did not see how the ground could be benefited. It was not at all necessary for them to enter upon the question as to the value of the sewage; they might fairly accept the statements made by those who were desirous of obtaining it. Considering the vast value which had been put upon the sewage by those who had tendered for it, he thought the want of clearness, and the whole want of practicability, in the matter to have resulted from the circumstance that, whilst some gentlemen who had tendered were impressing upon the London ratepayers the great loss they would sustain by allowing the sewage to fall into the river, they had never treated any communication with their board as a *bonâ fide* or fixed plan, but had wanted the board to go into a speculation as to its uses—thereby thrusting upon the board the necessity of inquiring into the practicability of their schemes. For a man to judge competently of the utility of the sewage, it required him not only to be an engineer, but a chemist; and not only a chemist and an engineer, but also an agriculturist; and if he were not all three, he could not form an opinion of the real utility to which the sewage might be devoted. They were told that they had no need to complain of the system of tendering, because they were not asked to run any risk; they were not asked to devote a farthing towards the outlay, but merely to be recipients of certain profits. He entirely differed from that statement. He thought they were called upon to run considerable risk, for, if they started upon the premises that the sewage was of real value, they ran the risk of losing that value, whatever it might be, if they did not carefully understand the scheme about to be adopted. One gentleman said that the sewage, properly used, was worth to the metropolis more than £700,000 per annum. Suppose they put it at half a million per annum—suppose its value to the board was half a million, as was shown by figures which were certainly to the satisfaction of the gentlemen who used them; if it was worth half a million a year, it was worth a capital sum of 10 millions. Now, if they, with that commodity worth 10 millions of money, entered into a scheme which eventually proved useless, they would have lost that 10 millions of money, because they would guarantee the sewage to the gentleman who proposed to use it in perpetuity, and would have no power of recalling it. Were they prepared, upon the information they had of the tenders that had been submitted, and the calculations which were not vouched to, to entertain a scheme which would take entirely away from the board for ever and ever that which, upon the showing of the gentleman, was worth 10 millions of money, or half a million a year? It must not be supposed that the board was indifferent to the realization of that sum of money; nothing would delight the board more than to have the opportunity of expending half a million in the improvement of this great metropolis. They knew full well the difficulties and anxieties which every member of the board experienced, when he was endeavouring to effect some great improvement for his own district, in not being enabled to see his way clear for the funds; and if they would be enabled, by the sale of that commodity—which he believed to be valuable, and which he believed would ultimately prove to be valuable—to realize an amount that would put aside all those difficulties, the board would prove great benefactors of the metropolis; and they would not be dealing unfairly with the promoters. There was not, in any of the plans, anything which sufficiently explained the manner by which that sum was to be realized; nor did he believe that any one of the gentlemen had made up his mind as to what they would be justified in guaranteeing to the board. If he referred to the tender of Mr. Ellis, he should say to him—"You have shown, by elaborate figures, that the board would realize from your system of utilizing the sewage, £787,000 per annum; but the board will take less than that—they will be content with £500,000; or, if you will guarantee to the board the payment of £250,000 annually, I will promise you that you shall have my vote for the concession; and I shall not stop to inquire whether the sewage is of value or not." If Mr. Ellis was not prepared to guarantee to the board the payment of £500,000 annually, they would not be justified in accepting his figures; that was the conclusion he had come to. A letter had been read that day, in which the thing had been put exactly as he had thought for some time it ought to be put. It was the first letter from Mr. Nelson, in which he said: "Having arranged a system for the utilization of sewage, by which manure manufactured from it might be disposed of to a very large extent, both in England and abroad, and a rent, at a definite rate per ton, realized by the board, I should be obliged if you would favour me with information respecting the following particulars:—First, whether the board would be willing to take into consideration a tender for a portion only, and that comparatively small, of the London sewage." He then went on to ask a series of questions, all of which might be answered in the affirmative; and for a small portion of the sewage he proposed to guarantee a certain sum. The letter contained a definite offer for whatever quantity was used. He (Mr. Newton) was sure that every one must rise from the perusal of the evidence that had been given before the various commissions and committees of the Houses of Parliament, and the documents which had been given to the world by the scientific men of the country, with a knowledge that there are great differences of opinion in the minds of those most likely to be well instructed upon the subject. If that were so, he fully agreed with Mr. Nelson that the thing should have small beginnings, and that it should grow; by so doing, they prevented themselves from being committed to any great length of time, either to one hundred years or to a perpetuity, by the acceptance of something which might be superseded, in the course of a few years, by some chemical discovery by which sewage might be much more beneficially used than was proposed at the present time. He thought, therefore, there would be a very great advantage in deferring the matter, and inviting the gentlemen who had tendered before the committee to give information upon such points as were not clear; and he would like it to be put to them at the committee, whether they were prepared to guarantee, in some efficient manner, the payment of a distinct sum for a certain number of years, taking the responsibility upon themselves. They could not treat on any satisfactory basis until that had been done. There was in the metropolis a growing feeling in favour of entertaining this question and in favour of the board doing something; and he thought they ought to be very much gratified that that feeling did exist, for the board, and the local boards under it, had too much reason to complain of the comparative indifference with which the affairs of the metropolis were regarded by the ratepayers generally. He hoped, when they had the committee, they would take down as much evidence as could be obtained, so as to make the ques-

tion clear and practicable. He fully agreed with Mr. Richardson that it was their duty to make some return to the earth for the benefits which they derived from it; and he thought that this reason, conjoined with the more practical reason of benefiting the treasury of the board, and, consequently, the metropolis, should weigh with them in the consideration of the important question; and he sincerely hoped that their deliberations would enable them to come to some conclusion by which the great consummation they so much desired might be achieved.

Mr. DIXON entirely agreed with what Mr. Newton had said. He should be most happy to attend the Main Drainage Committee, and, as far as his practical knowledge went, to offer suggestions to the committee for their consideration. Independent of the advantages they might derive from the sale of the sewage, they would be conferring incalculable benefit if they cleared the river from the nuisance. He hoped, however, that they would be very careful in what they did; but if any satisfactory plan could be adopted, he felt most strongly that it would be very beneficial to the town and to the ratepayers.

Mr. COLLINSON thought the assistance of the board might be offered to persons who would tender, or desire to tender, to take the sewage in small portions. He was of opinion that if a perpetual cession of the sewage were made, it would necessarily be a loss to the metropolis. In any one of the proposals made, there was nothing tangible for the metropolis to take, at all events, for twenty or twenty-five years. The promoters required a concession for a long period of years, and the board would only be entitled to a portion of the surplus profits; the public, therefore, at large would get very little benefit. He strongly recommended that a concession should be of a small quantity of the sewage, as by that means its market value would be known, and they would know how best to dispose of it. He would like to know whether they could not obtain powers to convey the sewage to small stations, so that it might be available for persons in different localities. It would then be tried on different kinds of soil and soils differently cultivated, and by that means they would certainly gain experience, and that was what they wanted beyond all things.

Mr. FREEMAN said it must not be understood that by referring the subject to the Main Drainage Committee, it would be referred to a small committee; on the contrary, they would all be able to take part in its consideration. He did not wish to make any remark upon the facts which had been brought forward by Mr. Richardson as to the value of the sewage. He (Mr. Freeman) believed he was an enthusiast, and that if they looked into the majority of those facts which he brought forward, they would not hold good at all. There could be no denying that it was a most important question, not only with regard to the value of the sewage, but also with regard to clearing the river. In the next place, it was far better that they should use the sewage in a profitable manner, if possible, than let it run to waste. At the present moment the commercial value of the sewage was a speculation. One gentleman said it was worth so much, and another gentleman said it was commercially worth scarcely anything. That difficulty stood in their way in regard to accepting the tenders; but the question was, whether they were to leave it entirely to the persons tendering, without assisting in any way to solve the question and to find out its value. He was afraid, unless they did begin in some such way as that, by obtaining some small portion in order that its value might be proved, it would be a difficult thing for them to arrive at the commercial value of the sewage in anything like the next fifty or one hundred years.

Mr. CRELLIN said the difficulty he found in disposing of the sewage, in the first instance, was the dread of creating a public nuisance; and it was that particular point that was constantly urged when they had to determine, not what should be done with the sewage, but where they were to dispose of it. He was not at all surprised that great interest had been excited out of doors because of the statement which had been made by different persons that the value of the sewage was worth between £1,000,000 and £2,000,000 per annum. He would not wish to be quite so liberal as Mr. Newton, who was willing to secure a quarter of a million per annum, because, if the party who suggested the figures upon which Mr. Newton calculated had made those calculations correctly—and he would take it for granted that he had made them correctly—he should not be satisfied with so small a sum as a quarter of a million. The proposition made was that, after paying 5 per cent. to the shareholders, and the working expenses, the remainder should be divided between the board and the company. Mr. Newton had forgotten that the £787,000 which had been suggested was only half of the profit; and, although he should be glad to see the shareholders well remunerated for their risk, he did not think they should have so much as that.

Mr. LAMIN thought the value of the sewage very much exaggerated. All the cases referred to were in small towns in the country, where the drainage or sewage was of a very different character from the London sewage. They would do no good by the question going into the drainage committee in the shape now proposed. He should like very much to test one of the tenders, but he really did not know how many *bonâ fide* tenders there were before them. He proposed, with a view of testing the capability of one of the tenders, the board should offer a concession of certain sewage to Lord Torrington and others, subject to such modifications and securities as the Main Drainage Committee might require.

The CHAIRMAN said he understood the object of the question being referred to the Main Drainage Committee was to enable them to examine in detail the propositions which had been placed before them.

Mr. SANDERS said that none of the tenders fulfilled the terms of the advertisement; therefore, none of the gentlemen tendering could say they were being hardly dealt with, when their tenders were not explicit. He did not express an opinion as to whether the advertisement was a wise one; but at any rate it had not been complied with. It would not matter if the subject was not definitely settled for a year or two. They had no business to give away to any company or set of gentlemen that which might, in ten or twenty years time, be of immense value in reducing the rates. Even if a series of experiments were organized, at the expense of the board, he believed it would be to the ultimate advantage of the ratepayers. He advised that every one of those gentlemen that had given tenders should be examined before them. They should endeavour to obtain information from everybody and anybody who was willing to give information; and then to make a report giving the result. They might then be in a position to ask for tenders for the whole of the sewage or any portion. His impression was that they ought to be great salesmen, and ought to be certain as to the article they had in hand, how they could supply it, and what it was worth. He thought the general subject should be referred to the consideration of a committee—whether Main Drainage or otherwise; he cared not what it was so long as it was a thoughtful and earnest committee.

Mr. RICHARDSON asked if he might be allowed to change the resolution to the following form:—"That inasmuch as none of the tenders have complied with the terms of the advertisement, the subject of the utilization of the sewage of the metropolis be referred to the Main Drainage Committee, for their consideration."

Mr. D'IFFANGER: Perhaps I may be allowed to join that at the end of my amendment.

The CHAIRMAN said he thought the board were bound to do justice to the parties tendering, as they had gone to great trouble and expense, and they ought at all events to be heard.

Mr. Richardson's motion was then put to the board, and lost.

Mr. D'Iffanger's amendment was carried, and stood as the original motion.

Mr. SANDERS then proposed the following amendment:—"That inasmuch as none of the tenders have complied with the terms of the advertisement, the tenders on the subject of the utilization of the sewage of the metropolis be referred to the Main Drainage Committee, for further consideration and report." He said that put the subject more simply and clearly. He did not think it wise for the board to express any opinion as to what was their duty by Act of Parliament, they knew their duty, and they ought to do it. They should not express any opinion as to their works being a nuisance. The public had confidence in the board, and were not afraid that they were going to annoy them; and he thought it was very unwise that they should express an opinion as to what the effect of the distribution of the sewage on the land would be. The tenders did not comply entirely with the terms of the advertisement; the subject was open for further consideration, and therefore he proposed that the whole affair should be reconsidered. He begged to move the amendment.

Mr. RICHARDSON seconded it.

Mr. NEWTON said he thought Mr. Sanders considered that Mr. D'Iffanger's resolution aimed some censure at their present works, or asserted that they were likely to prove a nuisance. He (Mr. Newton) did not understand the resolution to do anything of the sort. It simply recited a portion of the Act of Parliament, or rather the spirit of the various Acts of Parliament, and said, "that inasmuch as the board are bound by various provisions of the several enactments under which their works are carried on, so to conduct them as not to cause a nuisance." Nobody could doubt that the board were bound by that; and that being so, it was a fair view to start from, because if it could be shown that it would cause a nuisance it was their duty to resist it, and if there was not sufficient information on that part of the question they should have it before they proceeded. The resolution went on to say—"and that the profitable employment of sewage under the schemes proposed in the tender may involve its application to the surface of the land on an extensive scale, they cannot be parties to any agreement for such application, unless they have clear information on the localities, nature, and extent of the land to be so dealt with, and satisfactory assurance that the processes to be employed are such as not to cause a nuisance." They were bound to hear the statements of those gentlemen who had made tenders, and it would only be courteous to give them some reason why the board could not accept their tenders at the present stage of the proceedings and without further information. It was clear that the object of both the motion and amendment was the same—to refer it to a committee, with a view to get the greatest amount of information they could upon the question, not only as regarded the tenders, but as to any other scheme that might be brought before the committee. The resolution expressed it in a manner which would be more acceptable to the public and to those who had tendered than the amendment did, which was a mere emphatic declaration that they would not do a certain thing, and that they would do another, without condescending to state a single reason.

Mr. CARPMAEL said that some years back, a gentleman who made himself very largely noted with regard to the distribution of manure, proposed a scheme, and to a large extent carried it out, for carrying in large barges the sewage of a town of Yorkshire. Those barges were taken up the navigable canals and rivers, and the manure was covered over the immediate neighbourhood. It became such a nuisance that they were soon ordered away, and were never permitted to carry out the plan. Again, some years back, a company was started in the metropolis, and they proposed to toss the manure on to the garden ground in the suburbs. That scheme was also prevented on account of its great objections. It, therefore, became of large importance to the board to know where the sewage, if used without deodorization, was to be applied, because that was one of the most important things the board had to observe in regard to dealing with that mass. They must bear in mind that their quantities came up to millions and millions. That the distribution of the sewage over certain classes of land was highly desirable, no one could doubt, and the only question they had to solve was, supposing it was used in a state of solution, i.e., in its present fluid state, that they must distribute it over a very large area of country. Then they must ascertain where those large areas were, in order that they might judge whether the distribution of the sewage, if not deodorized, would be likely to cause a nuisance. There remained two points to be ascertained, the large area over which it could be used, and the cost at which they could deposit it on the land from time to time, as it was ready to receive it. There were not many spots within the area of the metropolis that could have sewage pumped on them. (No, no.) A gentleman said "No, no." His enthusiasm was such that he thought it was merely a mechanical problem as to the pumping; but he (Mr. Carpmael) would tell him that that "merely" required a great deal of consideration. Not one of the tenders had dealt with the subject. There was a large number of figures in one of the tenders, but not one of them had dealt with the cost that would have to be gone to, to deposit the sewage over a given area, and the benefit to be derived from it. At present, there was nothing in a tangible form that the board could come to a resolution upon, except the tenders. Let the whole go to the committee that they might investigate it; let them have the several persons tendering before them, and, if they could give them satisfactory explanations, he would only be too glad to assist in getting that great return that some expected. To utilize the whole of that vast fluid would require a very large outlay with regard to original plant, and there would be a large annual expenditure in the matter of power, as it was proposed that the whole should be raised 400 feet. With regard to the distribution, it became a large water company; and everybody knew by experience that there was a very large establishment of engineers, turncocks, and others, employed in the distribution. If they only took the account of one large water company, delivering a certain quantity of water every year, they would find it would go into £5,000,000 or £6,000,000 in the first outlay, and a very large expenditure afterwards. The sewage was highly valuable; and the only thing was, had they materials before them, or could they get them—for it was their duty to get them if they could get them—to enable them to come to a right conclusion. At present, he had no hesitation in saying that they had not, from the tenders, such information as would justify them in coming to any conclusion about the matter; and the only thing they could do was to send the question back to the committee, to invite the promoters of the various schemes to tell them all they knew, and then to test it with the

best experience they could bring to bear upon the matter. Then, and not till then, ought they to decide what course of action the board would take with regard to the sewage of this metropolis.

Mr. Sanders' amendment was then put, and lost. A division was claimed; when there appeared—

For Mr. D'Iffanger's motion	17
For the amendment	4
Majority	13

The board then adjourned.

THE GAS QUESTION IN YARMOUTH.

At a Meeting of the Town Council acting as the Local Board of Health, held on Monday, the 30th ult., the committee appointed to consider the question of lighting the public lamps reported that they met on Friday, the 20th of November—the Mayor presiding—and took into consideration the letters of the gas company of the 17th of July, 1862, and the 15th of September, 1863. The first, from the chairman of the gas company, Mr. T. Brightwen, addressed to the town-clerk, was to the effect that the company had taken into consideration a resolution of the Board of Health committee, "That it would be desirable to light the public lamps during the whole of the winter months, from the 29th of September to the 25th of March, from one hour after sunset to one hour before sunrise, instead of omitting, as under the present contract, the five nights at and nearest the full moon; and, during the summer months, from the 25th of March to the 29th of September, from one hour after sunset to one hour before sunrise, except during five nights at and nearest the full moon. That for such lighting the board pay £3. 5s. per lamp." The company declined the offer; but, after mature consideration, and upon what they believed to be substantial grounds, they named £3. 12s. 6d. as the minimum price at which they could undertake to light the public lamps. Mr. Brightwen added, that the company would be willing to light the lamps every night during the year, from one hour after sunset until one hour before sunrise, for £3. 15s. per lamp. In the next letter, signed by Mr. Willis, the secretary, the attention of the town-clerk was directed to the 48th section of the company's Act, by which it was to be observed that the sum to be paid by the local board was the lowest price charged to private consumers. By way of estimate, and not of contract, the price per lamp, for lighting every night during the year, from one hour after sunset to one hour before sunrise, would be £5. 10s. 4d. If paid within two months of the 25th of March and the 29th of September, 4s. 9d. would be allowed as discount, or £5. 5s. 7d. per lamp. Price per lamp for lighting every night, except the three nights at and nearest the full of the moon, from one hour after sunset to one hour before sunrise, would be £5. 0s. 2d., or, if paid as before mentioned, a discount of 4s. 3d. would be allowed—total, £4. 15s. 11d. per lamp. Price per lamp, for lighting during the hours they were now lighted under the last contract, at the present price, would be £3. 12s.; discount, 2s. 10d.; net, £3. 9s. 2d. The total expenditure for the public lamps was, till this notice was given, about £880 per annum. The amount now demanded by the gas company for gas to be supplied to the public lamps for lighting them every night, was an increase above the company previous demand of £1. 10s. 7d. per lamp, or about £450 per annum. The amount for lighting every night, except during the three nights at or nearest the full of the moon, was an increase above the previous demand of £1. 3s. 5d. per lamp, or £345 per annum; and the amount for lighting for the same hours as under the last contract, and which was very unsatisfactory, and considered a high rate, was increased 9s. 2d. per lamp, or £135 per annum. This large increase was demanded, notwithstanding that the profits now divisible amongst the shareholders in the gas company were to be considerably less than prior to the passing of the Gas Act. The question was one in which the town at large was greatly interested, as the increase in price now demanded would increase the board's rate 2d. in the pound per annum on the amount required by the company last year, if the lamps were lighted from sunset to sunrise every night. The gas company had reduced the price of gas to private consumers from 5s. to 4s. 9d. per 1000 feet; but the increased price now demanded for lighting the public lamps would amount to more than the reduction made. For instance, the total reduction to private consumers would amount to about £400 per annum; while the total increase required of the public in another shape would be about £450 per annum. The committee considered that the rate both to the public and private consumers was much too high, and ought to be reduced. Under the above circumstances, the town-clerk had been directed to ascertain at what price another company would light the public lamps, and also directed him to procure an estimate of the price at which new works could be constructed and gas supplied, not only to the public lamps but to private consumers.

A report had accordingly been made by Mr. George Wilson Stevenson, C.E., F.G.S., which was dated from Halifax, Nov. 2, 1863, and was to this effect:—He recommended that the company should be emphatically a "gas consumers company," in which consumers, whether shareholders or not, should enjoy a proportionate advantage in the success of the operations. The present consumption of gas in Yarmouth was about 32,400,000 cubic feet, of which 28,956,000 feet were taken by private consumers and 3,444,000 feet by the public lamps. If the corporation desired to light the lamps every night all the year round, from one hour after sunset to one hour before sunrise, with a full flame, this would bring the consumption to 5,740,000 feet per annum. He would assume at least an equal division of business with the existing company, and add 14,478,000 feet as the probable demand from private consumers, making together about 20 million feet as the total quantity which the Consumers Company would be required to deliver. This, with a leakage of 10 per cent., would involve a make of about 22 million feet a year, or 123,000 feet a day in mid-winter. The total cost for retorts, retort-house, condensers, purifying-house and sheds, distribution of apparatus, consisting of nearly 12 miles of pipes, service-pipes for 700 consumers, engineering, legal expenses, working capital, &c., &c., he estimated at £16,540. This sum, however, did not include anything for land, or meters, or lamp-pillars. The first would be leasehold, and form a small item in the annual expenses; the second would be provided by a company, on terms favourable to this company; and the third would be provided by the corporation. The revenue and profits to be derived from the undertaking might be concisely and accurately stated; and they might take as a guide the published accounts of the existing company, taken in connexion with the evidence given before Parliament in the last session. The company made, last year, 36 million feet, and sold 29,360,000, thus showing a leakage of 18 per cent. The cost of producing this 36 million feet of gas was £3787, which gave 30·95d., or nearly 2s. 7d., as the cost to the company of each thousand feet at the consumers meters. If the leakage of the company had been 10 per cent. (more than which the company ought not to permit), the cost price would have been under 2s. 4d. per 1000 feet. A comparison of these figures with the selling price of gas was quite sufficient to show that the trade of gas making was a lucrative one, and that the Yarmouth Gas Company had not lost sight of their own interests in charging about 100 per cent. upon the cost price of it. He should recommend the Consumers Company to sell it as follows:—Income: 14,500,000 feet to be supplied to private consumers, and 5,740,000 feet to be supplied to the public lamps, at 4s. per 1000 feet, £4048; less discount to large consumers, £300. Total income, £3748. Expenditure: 20,240,000 feet of gas, costing 2s. 4d. per 1000 feet, and 2d. for contingencies, £2530. Allow 7½ per cent. profit on £16,540 capital, £1218. Total, £3748. As the consumption of gas increased, these prices should be reduced. The Gas Consumers Company ought to give their customers the benefit of all profits over 6 per cent. If this were arranged, the price would be lower than 4s. per 1000 feet to commence with. There was, undoubtedly, a fair opening for another gas company in Yarmouth. The present works being at the extreme south end of the town, the lighting of the north end would become every year more difficult, as buildings extended northward. Works, therefore, erected at that end of the town would supply all that part and the centre of the town, while the existing works might supply the district to which they were adjacent. In no other business could such a monopoly as the present company had enjoyed for years, and sought to perpetuate, have continued for a single day; especially as that monopoly had enabled its fifty proprietors (of whom only eighteen were resident) to remunerate themselves with £3000 a year upon a capital of only £27,000. The price of gas in Yarmouth was quite out of proportion to its cost, and more than in neighbouring towns where the value of materials and labour were greater. At Norwich and Ipswich the price was only 4s. per 1000 feet, with discounts to large consumers and punctual payers; while in Yarmouth, with easy transit for coals, low port dues, and no dock or quay dues, the charge for gas was much higher. If the present company were allowed to make any large additional expenditure upon their works, without competition, the public would have to wait for many years before they obtained a proper reduction in the exorbitant price now demanded from them. Mr. Stevenson concluded by saying that he was prepared to take payment for professional services in the shares of the company, and to find a contractor of the highest repute who would execute the works within his estimate; and, if desired, a lessee who would take them for a term of years, guaranteeing a good rate of interest upon the capital.

The committee, however, recommended, in order to avoid disputes with the gas company, both as to the price of lighting and the value of corporate property—of which notice had been given by the company to take the same—

1. That the Local Board of Health guarantee, in such a manner as should be agreed upon, to the shareholders of the gas company, the interest of 8½ upon the present capital of the company.
2. That the Local Board pay the debts and execute the contracts of the gas company up to the time of settlement.
3. If necessary, the Local Board, at their expense, procure an Act next session, to carry into effect these arrangements.
4. That the works of the gas company be vested by the Act in the Local Board of Health, and any deficiency made good by the Local Board's rates, and any profit to go in reduction of the rates.

The committee conceived that by this means all complaint by the gas consumers would be removed. That the saving in the cost of the land, and litigation, &c., and by the board being enabled to borrow money at a less rate of interest, and in other ways, must be a considerable saving to the ratepayers, and no loss could accrue to them. That as far as the shareholders in the gas company were concerned, they had now only an interest in the gas-works to the extent of £2550 per annum, being 8½ per cent. upon the capital of £30,000; and the committee considered that they would be placed in a much better position than at present or at any future time, and they would be free from competition. If the gas company were inclined to meet the board and town in an amicable spirit, terms and differences might be arranged; but, if the company were resolved to maintain the present high price of gas, the board considered it to be their duty to protect the public. The committee recommended the board to contract with any new company for lighting the public lamps and buildings at 4s. per 1000 feet, and offer to lease to such company a piece of corporation land upon the same terms as the land had been leased to the existing company; and give leave to the new company to lay down pipes and mains through the soil of the corporation, and under the roads, &c. The committee concluded by saying that, if a new company were formed, it would be a great boon to the consumers and ratepayers.

The MAYOR, as chairman of the committee, moved the adoption of the report.

Mr. W. WORSHIP described the report as a garbled and unfair one, and said that certain letters received from the gas company had been omitted, which would, if inserted, have given the question a different complexion from what it now assumed. He complained of the offensive term "monopoly," which had been so freely used in the report, and of the one-sided way in which it was drawn up. He was opposed, therefore, to its being circulated in its present form, and moved that it be referred back to the committee to state the whole facts.

The TOWN-CLERK said he was not aware that any letters had been omitted; and,

The MAYOR observed that the company would have an opportunity of answering the report publicly, if they had anything to complain of. If any letters were omitted, they could be added to the report.

Mr. WORSHIP complained of the whole proceeding on the part of the committee. The Act would never have been applied for were it not for the difference between the company and the town authorities, which on the part of the latter became of a personal character. It was incorrect to say the company had had large profits, as they did not average from the commencement more than 4 per cent., and the Act expressly provided for a certain amount of dividend, any excess above that to be divided among the consumers. The money spent in litigation was little or nothing to the company, but to the consumers every penny spent was injurious.

Mr. PRESTON observed that the gas company had shown a willingness to meet the wishes and interests of the public, by a reduction from 5s. to 4s. 9d. since the passing of the Act.

Mr. SCOTT: Yes, but gas costs us more now than when it was 5s. (Laughter.)

The report was ordered to be printed and circulated, together with the letters referred to by Mr. Worship, and has been since issued with the following correspondence by way of addenda:—

[Copy.]

Letter from the Clerk of the Local Board to the Directors of the Gas Company.

Great Yarmouth, Sept. 23, 1863.

Gentlemen,—I beg to acknowledge the receipt of your secretary's letter of the 15th instant with an estimate for the price of gas for the public lamps. I have laid it before the committee appointed by the corporation to consider that question.

The committee direct me to call your attention to your letter of the 17th of July, 1862, in which the directors then, upon what they state to be a "sound principle, and after most mature consideration, and upon what they believed to be most substantial grounds,"

Offered to light the public lamps every night, per lamp, for . £3 15 0
For which same service the company now require to be paid £5 5 7

or an increase of £450 per annum on all the lamps, and in the same proportion for lamps lighted during shorter periods.

The committee are aware of clause 48, inserted by the gas company in their Act, but from the wording of that clause, and the clause in the General Act, the company can agree to light the public lamps upon any reasonable terms.

The committee consider that the rate of 4s. 9d. per 1000 as too high a rate for the consumer. At Ipswich it is now only 4s. per 1000.

According to the calculation of the committee, the amount of increase for the public lamps, if lighted every night, will be rather more than the reduction of 3d. per 1000 to all the private consumers, so that, although the amount of profit to the company, under their Act, is to be much less than before that Act passed, yet the gas company will actually receive more money for gas; and the gas consumers, whilst supposing they have a reduction of 3d. per 1000, will have to pay rather more than that amount in the increase to the Board of Health rates, made necessary by the increased charge for the public lamps.

The committee direct me to say, that they cannot, for the Local Board of Health, agree to such terms for lighting the public lamps, as mentioned in your secretary's letter.

They are advised that they can even have separate works constructed here for lighting the public lamps and buildings (and which, under the local Acts, they consider they can do) at a less price, including the manufacture, interest, and depreciation, than is now demanded by the gas company. If the gas company will agree to reasonable terms for lighting the public lamps, the committee are prepared to enter into a contract for that purpose.

If not, they feel that they must recommend the local board not to enter into any fresh contract with the company, but to require the gas company to light their lamps under the powers of the Gas Act, for such time as the board deem requisite, and as soon as possible procure the public lamps and buildings to be lighted by other means.

The committee, however, beg me to state that they wish to avoid all further disputes with the company, either as to the price of gas, or the price of the corporation land, or leaseholds, or the rentals, and if the company will entertain the following proposals, they will recommend them to the local board (viz.)—

1. That the Local Board of Health guarantee, in such manner as shall be agreed upon, to the shareholders of the gas company, the interest of 8½ per cent. upon the present capital of the company.
2. That the local board pay the debts and execute the contracts of the gas company, up to the time of settlement.
3. That the local board, at their expense, procure an Act in the next session, to carry into effect these arrangements, the Act to be approved on behalf of the company.
4. That the maximum price of gas be reduced by that Act to 4s. 6d. per 1000 feet. At which price the committee feel sure the local board can supply the gas.
5. That the works of the gas company be vested by that Act in the local board, and any deficiency be made good by the board's rates, and any profit go in reduction of those rates.

The committee conceive that, by this arrangement, all complaint by the gas consumers would be removed. That the saving in the cost of the land and litigation, and by the board being enabled to borrow money at a less rate of interest, and in other ways, must be a considerable saving to the ratepayers, and no loss can accrue to them. That, as far as the shareholders in the gas company are concerned, the committee consider that they would be placed in a much better and more certain position than at present, or at any future time; they would be for ever free from competition, their interest would be regularly paid, their shares would be of greater value to them than they can ever be in any other manner, and a clause might be inserted in the Act, by which the shares might be redeemable at a fair price; and the directors would, moreover, be relieved from the complaints that must arise between buyer and seller, from the unpleasant position of working for the benefit of the public only, which will be the case after payment of their interest.

The committee conceive that if the gas company are inclined to meet the board and town in an amicable spirit, terms similar to these proposals may be arranged, and all differences that may have arisen will be amicably settled, and future difficulties avoided. (Signed) Charles Cory, Clerk.

To the Directors of the Gas Company.

[Copy].

Reply of W. Worship, Esq., Solicitor to the Gas Company, to the Clerk to the Board.

Great Yarmouth, Sept. 26th, 1863.

Dear Sir,—The directors of the gas company yesterday showed me your letter to them of the 23rd, and your prior correspondence with them, respecting the lighting of the public lamps.

In reference to that portion of your letter in which you say that the local board cannot agree to the terms mentioned in the secretary's letter, I have advised the directors that it is in effect a notice not to supply the public lamps, and as the 29th instant, when the existing contract expires, is so near at hand, and as I am sure it cannot be the intention of your board that the lamps should not be lighted, I must beg of you, on or before that day, to give the notice you suggest requiring the company to light the lamps for some specified time, and during certain specified hours. For whatever gas may be thus consumed, the company must charge at the rate specified by the 48th section of their Act.

I entirely dissent from the opinion you express, that under the powers of the general Gas Act the company are in a position to contract to light the public lamps, upon any other terms of remuneration than those which the Special Act expressly defines.

I am well advised when I say positively that they cannot.

I observe the extracts you quote from the directors letter of July, 1862, and though I do not know that any good can arise out of the discussion, yet I would remind you that the past and present powers of the company are widely different. In July, 1862, they were in a position and anxious to contract to supply the public lamps upon terms which, in reference to charges made in other places, appeared to be just; but the terms offered were not accepted. The points in dispute then, as on former occasions, led to personal differences, and it was mainly to discontinue this state of things that the company was induced to go to Parliament. The almost unrestricted powers they possessed, now are at an end. The sums they can now charge are defined and limited, and they are altogether in the consumers power to enforce a reduction of price whenever the earnings exceed the prescribed rate of interest on the capital for the time being. This capital, by the Act, is fixed at £30,000. It is largely increased by the board's opposition, though, in reference to the bill, as Lord Redesdale settled it, and as handed to you prior to our going into the Lords committee-room, and the Act, the only substantial alteration is the clause compelling the company to sell the new shares by auction. Then shortly comes a large expenditure in the construction of new works; and last, but not least, the enormous sum required by the Council for their property. To the shareholders and directors all this is comparatively immaterial, but to the consumers, who alone have to pay the interest, the question is a very serious one, and perhaps you will excuse my saying that I never could understand on what principle of fairness the public lamps should contribute less towards making up this interest than the private consumers.

Regarding the committee's proposals to purchase the works, it seems to me that they are exceeding the powers committed to them. Assuredly the directors of themselves cannot settle the question, and on this point I have merely to say that I will lose no time in obtaining the shareholders opinion upon any offer the council may be pleased to submit. (Signed) William Worship.

To Charles Cory, Esq.

ON MAGNETO-ELECTRICITY, AND ITS APPLICATION TO LIGHTHOUSE PURPOSES.

By F. H. Holmes, Esq.

[From the *Journal of the Society of Arts.*]

As this is a paper on the application of magneto-electricity to lighthouses, I will begin by saying a few words on lighthouses themselves, their former and present state, and the systems now generally followed in the arrangements for lighting.

Formerly, lighthouses were very few, and were nearly all coal fires on high cliffs or towers, and most of them were the property of private individuals; but as shipping increased, so the lighthouse system became more and more developed, both in the number of lighthouses and in the improvement of those already existing. The coal fire gradually gave way to the oil lamp and candles; next we find the introduction of spherical mirrors or reflectors, and these again were superseded by parabolic reflectors, sometimes to the number of more than thirty in one lantern. After this came the introduction of the "Fresnel lens," which took the place of the reflectors and their lamps, however numerous they might be, and required instead one central lamp.

This "Fresnel lens" has again grown, so to speak, larger and larger as the want of a more powerful light was felt, till it has now a diameter of 6 feet and a height of 10; for, to increase the quantity of light, the size of the lamp must be increased, and the lens in proportion, or it would have been so far out of focus that the intention of the lens would have been frustrated.

To make these progressive improvements in lighthouses, vast sums of money had to be expended; and now let us see what was the end sought. First, to improve the light itself. This is done by the substitution of a lamp of four concentric wicks, the largest nearly 4 inches in diameter, for the coal fire. If the improvement had stopped at that it would have been small indeed, but this lamp is more under command than the coal fire. The value of the introduction of oil is not so much, then, on account of its greater power as for its aptitude for the employment of economizing apparatus, whether this consists of reflectors or lenses. All incandescent bodies give out rays as it were from the centre to the circumference of a sphere; of such rays, only those which fall on the sea would be useful to the mariner; but by means of reflectors those rays which would pass inland, or upwards, or downwards, are reflected towards any required point, and, by a proper arrangement of a series of reflectors, the whole or nearly the whole of the rays are directed where required. The Fresnel lens consists of a middle refracting belt, and a double series of reflecting prisms, or zones, as they are generally termed; and, when properly constructed, it has the property of collecting all the rays into one horizontal beam, so that all the light from the lamp is utilized. Thus, then, we see great strides have been made since the introduction of oil lamps, as regards the lenticular apparatus—in fact, that may be said to be nearly perfect; let us then return to the consideration of the light itself for a moment.

Whether a large or a small lamp be employed, it will make no difference in misty weather, so long as the thickness of the flame is the same; for a large lamp may be equal to ten or twelve smaller ones, and, if replaced by these ten smaller, it will be evident that when one of these is obscured by mist the whole of them will be obscured. Quantity of light, then, will not add to its power of penetrating mist. By making the large lamp with four concentric wicks, the intensity of the light is a little increased, and such a lamp will penetrate further through mist in a slight degree. But it is in misty and hazy weather that the light is most required; hence, now that everything else is nearly perfect in a lighthouse, the authorities, both in this country and elsewhere, are directing their attention to the only thing wanting to make the whole system perfect—that is, a light capable of penetrating mist; and as this power depends on the intensity of the light, and electricity is capable of producing the most intense light known, it was naturally looked to as the possible means of perfecting the whole system. But the light produced by electricity, to be applicable for lighthouses, must be certain and constant—not liable to extinctions or any great variations, as the first would tend to endanger vessels seeking and not finding the light; and if a fixed light had much variation, it might be mistaken for a revolving light.

Let us now see whether electricity can produce a constant steady or uniform light. Frictional electricity will give a succession of flashes intensely vivid, and might be used for the purpose, but for the fact that the slightest moisture is sufficient to convey the whole charge to the earth. The various forms of galvanic battery are all capable of producing a steady and intense light, but still (besides the great expense) they are not applicable, because of the necessarily varying current, which becomes weaker and weaker as the solution becomes saturated. The magneto-electric machine is then the source from which one would naturally expect a light which should be invariable in its nature, and capable of being continuous for any given time, as the current produced by this machine is constant as long as the helices revolve with the same speed, and the speed can be easily regulated to any required velocity.

The electricity derived from a magneto-machine is induced in coils of wire, by the changing of the magnetic polarity of pieces of soft iron inclosed within the coils or helices; and the quantity or intensity of the induced current depends, first, on the amount of magnetism induced in the soft iron; secondly, on the facility with which the poles of the magnetized soft iron can be reversed; thirdly, on the velocity with which the change of polarity takes place; fourthly, on the length and diameter of the wire forming the helices.

The amount of magnetism induced in the soft iron depends on the size and force of the steel magnets employed, and on the weight and softness of the iron in the helices; but the weight in practice of the soft iron is limited by the weight of the steel magnets, for, if too heavy, the steel magnets will be slowly deprived of their magnetism. To facilitate the change of the poles, the soft iron cores of the helices are not solid pieces of iron, but are tubes, single, double, or treble, as it is found by experiment that the same weight of iron, when divided in this manner, loses or takes magnetism in much less time than when in a solid form.

There is a limit to the velocity to be employed when the maximum of electricity is required, for this reason. It has been already remarked that the amount of electricity depends on the amount of magnetism taken up, and that the soft iron takes time to become saturated, as it may be termed, with magnetism; hence, if the velocity be too great with which the cores move from one pole of a magnet to another, there will not be sufficient time for the cores to become saturated. But as again the quantity of electricity increases as the velocity increases, it is necessary to ascertain this maximum point exactly, which is easily done, either by experiment or calculation, based on certain data. The length and diameter of the wire require to be different, according to the current required; for a short thick wire forming the helices represents a galvanic battery composed of a dozen, say, of very large pairs of plates, whilst a long thin wire would represent a battery composed of thousands of small plates. In other words, supposing the size of the helices to

remain the same, if they are composed of thick short wires, quantity is obtained; but if composed of long thin wires, intensity will by the result.

From all this it results that there are certain laws known and established, by which a magneto-electric machine can be made to give a current of any given amount of electricity, with any given ratio between its quantity and intensity.

Having seen on what the production of the current depends, the next point to observe is the peculiar nature of this induced current. It differs essentially from a galvanic current in this, that while the helices are revolving, the direction of the current is reversed, as the core of soft iron passes each consecutive pole of the steel magnets.

It now remains to explain how the current generated in the wires of the helices is to be withdrawn from the machine. In the first place, all the helices are connected in two, or four, or more series, and in doing this great care must be observed that the direction of the coil of every alternate helix is in an opposite direction, that is, if one is wound as a right-hand screw, the next should be as a left-hand screw, or what amounts to the same thing, supposing all wound in the same direction, then the two inner ends of the wires must be joined of, say, numbers one and two, and the two outer ends of the wires of numbers two and three, and so on through the series; and lastly, the terminals of the series might be soldered into two insulated discs and then led from the machine by two pieces of metal kept in contact with the outer surfaces of these discs by a slight spring; such an arrangement allows the alternating current to pass from the machine, and such a current will produce a light, but this light has certain disadvantages. It is never white, but always more or less blue or brownish; in fact, it is like the electric light obscured by placing it behind a flame from spirits of wine. It is also extremely injurious to the eyes, both from its colour and its tremulousness; I, therefore, do not use this current, but in its stead I convert this constantly-inverting current into two that flow from the machine in one direction only. This is accomplished thus:—One half of the helices are arranged so as to arrive on the poles of the magnet at the instant that the other half are exactly midway between the poles. Thus there are two distinct currents; and what may be called the dead point, that is, the point when the current inverts in one series, occurs exactly at the time when the other current is at its maximum, so that if now the inverted currents can be again inverted in both of these distinct currents, and that the two now flowing in one direction can be united as one compound current, it is evident that the result will be a current nearly as uniform as that from a galvanic battery, with the advantage of equable continuity. This is done by the two commutators, which consist each of two insulated rings of metal, of such a form at the periphery that two rollers or rubbers change sides from one disc to the other at the same instant that the current is reversed. Then, by combining the two commutators, a combined current is obtained that will produce a constant white light or perform any of the other functions of the galvanic current, and in a more perfect manner, as it is more uniform in its action.

A steady and constant current thus obtained from the magneto-electric machine is only one part of the problem of producing a constant and steady light, and, although the most important part, still it would be perfectly useless without an efficient lamp or regulator. In order to understand this, it is necessary to explain that the carbon points used for producing the light or for converting a portion of the electric current into light, are consumed, and that the rate of consumption is irregular, owing to the irregularities in the structure of the substance used—which is the kind of graphite deposited in the gas-retorts sawed up into pencils about a quarter of an inch square; but, as the consumption is irregular, no clockwork with continuous motion could be employed for the purpose of causing the carbons to approach as consumed, for it must be understood that the steadiness of the light as well as its brilliancy depend on the two carbon points being maintained constantly at a certain distance corresponding to the strength of the electric current.

Many pieces of apparatus more or less complicated have been invented from time to time for the purpose of regulating the movements of the carbon electrodes, and many of them I have tried, but none of them, as formerly constructed, could be used in a lighthouse, because they were more or less uncertain in their action, and because the clockwork was too delicate and liable to accident in other hands than those of an electrician. The question, what constitutes a good regulator, must be answered by stating what it must accomplish; and, moreover, it must perform its several functions in the most simple manner. It must, in the first place, maintain the carbons at a given distance, whatever be the variation in the state of consumption, and must also be capable of being adjusted to any strength of current; secondly, if by any accident the current should be interrupted, and the light thereby extinguished, the regulator should be capable of relighting at once with full brilliancy—that is, not only must it allow the carbon points to touch to re-establish the current, but must separate them again instantly, or there would be no light. Such a regulator we have here, for its construction is simple, and it performs its different functions in a most perfect manner. Its construction is this:—The upper carbon is attached by a kind of small vice to a bracket standing out from a tube, which slides freely in a column. The lower carbon is fixed in the end of another tube, exactly under the other carbon. Both of these tubes are put in motion thus: Two cords, passing over pulleys, properly arranged, are wound on one spindle, but in opposite directions. On turning a stud fixed on the end of the spindle the regulator is wound up—that is, the top bracket is raised and the lower tube depressed. On removing the hand from the stud, the upper tube would descend, and, being loaded, would cause the lower tube to rise; but to prevent this, while the regulator is out of use a bolt is pushed in, which prevents any movement in the regulator till it is again withdrawn. The regulator being wound up, the carbons are firmly fixed in their places by tightening the holders, and are then adjusted so as to bring the points in the focal plane by turning a spindle to which the fixed end of the cord belonging to the lower carbon is attached. So far, the regulator is only a means by which the carbons can mutually approach each other with a certain relative speed, depending on the different diameters of the two parts of the spindle around which the cords are wound. But if the carbon points remain in contact, there will be no light. Some contrivance, then, was necessary to separate the points to the distance which, by experience, is found to give most light, and to maintain that distance between the points constantly till the whole of the pair of the carbons is consumed. These two operations are accomplished thus:—The fixed end of the cord which works the upper carbon is attached to one end of a lever; the other end of the lever has a piece of soft iron attached to it, over an electric magnet, so that when the bolt is withdrawn, and the carbon runs together until they touch (thus allowing the current to pass), this electro-magnet instantly, by the action of the same current, lifts the cord, and with it the upper carbon, to the required distance. But this is not all, for the carbons would again run together were there not some contrivance to prevent them. To accomplish this, advantage is taken of these two facts—first, that the quantity of electricity is proportional inversely to the distance between the carbon points; secondly, that the strength of an electro-magnet is proportional to the quantity of electricity passing through the wire that surrounds it. Bearing these two facts in mind, it will be easy to understand the use of the second electro-magnet. Over this electro-magnet, at a small distance above it, is placed a lever, one end of which is drawn down by a spring, the strength of which can be regulated by a thumb-screw. The fulcrum is between this end and the centre. The other end of the lever is furnished with a catch, and immediately over the electro-magnet a piece of soft iron is fixed in the lever. On the carbons being allowed to touch as before, not only are they separated by the means described, but this second lever, acted on by its electro-magnet at the same instant, is drawn down towards it, and thus brings the catch between the teeth of a wheel placed under it for the purpose, and effectually locks the regulator. The strength of the spring is now adjusted till its tendency to lift the catch out exactly balances the current which draws it down. Should the distance now increase but the $\frac{1}{200}$th of an inch, the spring will be stronger than the current, will lift the catch, and the carbons will approach; but by doing so more current passess, the electro-magnet is strengthened, and is again enabled to overcome the spring and draw down the catch, and thus, by their mutual action, the distance between the carbon points is all but invariable.

When these regulators are employed in a lighthouse, there are a pair for each lens and two small lenses, so that although it may take ten minutes to replace the consumed carbons, still the light is never extinguished; for, suppose the carbons consumed in the lens No. 1, the regulator is ready in lens No. 2; and all the lightkeeper has to do is to bolt the No. 1 regulator, and draw the bolt of the regulator in No. 2 lens; the current is thus diverted, No. 2 is instantly lighted, and the lighting of this extinguishes No. 1.

Thus, then, we have a most intense light, which may be maintained for any length of time, which does not require to be trimmed or extinguished for a second, and which has all the steadiness and uniformity required for lighthouse purposes. Its advantages over the oil-lamp are:—first, its power can be increased *ad libitum* without increasing the size of the lens, for, if required, a machine may be made to give light enough to read by—say at ten or twenty miles; in fact, the light is in direct proportion to the power of the machine that produces it; secondly, its great intensity gives it a power of penetrating haze only equalled by the sun; thirdly, its whiteness distinguishes it most perfectly from all other lights on shore, which is one of its most important properties, for many a vessel has been lost for want of this property in lighthouses lighted with oil; fourthly, where coloured lights are required for the purpose of distinguishing one lighthouse from another, this light gives all the colours in a perfect manner, while the oil lamp always gives its own tinge to the colour employed; fifthly, from the facility with which this light can be extinguished in an instant, and as instantly lighted to its full power, it offers other means of distinguishing lighthouse from lighthouse which cannot be obtained with any other light. The importance of this may be understood from the fact that there are still many points around our shores that require lighthouses, but which must remain without them, till better means of distinguishing them with certainty from others in the immediate neighbourhood can be employed; for having no lighthouse is hardly worse for the navigator than having two in sight which cannot be distinguished one from the other.

An objection has been made to this light, that, being so small, it would be altogether invisible at a considerable distance; and when we merely consider that the apparent size of distant objects depends on the visual angle, there seems to be some ground for the objection; but the law of visual angles does not apply in the case of self-luminous bodies, as can be demonstrated with this piece of fine wire, which I suppose is almost invisible even with a strong light thrown on it; but now, if by passing a current of electricity through it it is made self-luminous, it appears gradually to increase in diameter as it becomes brighter; and, as a curious fact illustrating the difference between the theorist in his study and the practical observer, a sailor who had seen the magneto light from a great distance told me he supposed it must be at least ten feet in diameter. Another objection to the light is, that it is too bright; this may be an inconvenience in clear weather, but a light to be useful when most needed must be inconveniently bright in clear weather.

The last point to be considered is the cost of the magneto-electric light as compared with oil. The French director-general of lighthouses has made a report to his government both as to first cost and as to cost of maintenance; both are greatly in favour of the magneto-electric light; of course, in making their calculations of cost, they take the cost of an equal quantity of light in each case, that is, by oil and electricity.

I have now only to remark that this invention, if it may be called one, is purely English. Faraday commenced it when he discovered the fact that magnetism might be made to produce or induce an electric current; and although the magneto light was first produced in Paris, it was by me; and so far from receiving any assistance from any of the French *savans* in the matter, I was ridiculed by all of them for attempting what they said they could demonstrate was impossible. With regard to the regulator, which is also invented by me, there is another just invented by a M. Foucault, on a very different principle, but which is quite as effective, though overloaded with clockwork. His regulator has this peculiarity: it can be used in a rolling vessel, and will bear with impunity the vibrations of a steamer.

DISCUSSION.

Mr. LAWRENCE suggested that Mr. Holmes should give a description of the practical arrangements of his apparatus at Dungeness lighthouse.

Mr. HOLMES stated that at Dungeness, where the light had been in constant use since the 6th of June, 1862, there were in the lantern two small lenses, fixed one over the other, and two regulators to each. Only one light was shown at a time, but there were two regulators for each lens, so that an instantaneous change from one to the other could be made without extinguishing the light when fresh carbons were required. In the machine-room there were two magneto-machines, each capable of giving a powerful light, though both were in constant use. There was a distinct direct-acting steam-engine attached to each machine, and there were two Cornish boilers, each capable of generating steam enough for the two engines. The material consumed at Dungeness was about 30 to 35 lbs. of coke per hour, and 5½ inches of graphite in the regulator per hour, the price of this last being under three farthings per inch. The principal item of expense was, at present, the engineer, who had charge of the whole apparatus, but he expected that when there were several lighthouses on this principle, it would be found than one engineer would be sufficient for as many as were at present under the charge of an agent, and that none but stokers and lightkeepers would be required on the spot. The magneto-electric machines which were at Dungeness contained 120 horseshoe-magnets of about 50 lbs. each, and 160 helices, but those which he now constructed contained only from 66 to 70 magnets, and from 88 to 120 helices.

The CHAIRMAN said he had listened with much pleasure to Mr. Holmes's very clear statement. He was glad to see present Dr. Gladstone, a member of the Lighthouse Commission, and he hoped that gentleman would favour the meeting with some remarks tending to illustrate this subject, which was one of national importance. It was most interesting to know

that the little electric spark, not bigger than a pin's head, obtained by Faraday from the magnet not very many years ago, should have led to this development of power in the hands of an able and ingenious man like Mr. Holmes.

Mr. SUMMERLIN referred to an invention of a somewhat similar character, by M. Berlioz, which, he believed, was superior to Mr. Holmes's apparatus. He would have been glad if Mr. Holmes had given some description of it.

Dr. GLADSTONE, F.R.S., said, as his name had been mentioned by the chairman, he could not but rise to bear testimony to the able manner in which Mr. Holmes had brought forward this subject. During the existence of the Royal Commission, he had an opportunity of frequently witnessing the experiments made with this apparatus at the South Foreland. The commissioners afterwards examined everything connected with the light-house system in France, where, at that time, when this brilliant light had been burning for half a year at the South Foreland, they were still making preliminary experiments, for they had not then overcome the irregularity of the current of electricity, and could not get a steady light. Since then they had advanced very rapidly, and orders had been given to place a double light of this description at Cape La Hève, near Rouen. The Dutch might perhaps be considered to have been before the French in the adoption of this system, and the Emperor of Brazil was probably before either. He did not think Mr. Holmes had exaggerated the power of this light, or the case with which it was managed, and he was glad to be able to say this, because they knew that an inventor, justly proud of his child, was often unconsciously disposed to give the best possible account of it. He was very glad to hear what Mr. Holmes had said with reference to the expense of an engineer being divided amongst several lighthouses, because that was the main difficulty. When the complexity of an instrument was increased, more skill was required in its mangement, and this necessarily led to expense. The great desideratum was to have a light which was capable of penetrating to great distances in misty or rainy weather, and in that respect this light was far superior to the Fresnel lamp, which was quite competent to send a light to the extreme horizon on a clear night. In a dense fog no light whatever was of any use; but a mere mist, or a shower of rain, the electric-light could penetrate. There was abundant testimony that the lights at Dungeness and the South Foreland had been seen by the captains of steamers crossing from Folkestone to Boulogne, at a far greater distance than an ordinary oil-lamp. Moreover, the intensity of this light could be augmented to any extent. Professor Faraday, in his reports to the Trinity House, had laid great stress upon this. All that was necessary was to double the number of magnets, and practically this was easily done, because there were duplicates of everything in such lighthouses, and in foggy weather it was possible to bring the power of both machines to bear upon one instrument; and in that way double the intensity of light could be obtained. Then, further, supposing the fog to be so dense that no light could penetrate it, the steam-engine on the premises might be employed to blow a horn or whistle, or to make some other noise which would serve as a direction to vessels. This had been pointed out by M. Regnault, director of lighthouses to the French Government, and was of great importance at a time when the question of fog signals was attracting so much attention.

Dr. BACHHOFFNER said, having been engaged in most of the patents taken out for producing the electric light, he had some little knowledge of the difficulties which had hitherto been considered almost insurmountable in producing the results which had been shown this evening. The great merit of this plan was the particular mode in which the electric light was obtained, and in this respect, as far as he had seen, Mr. Holmes had displayed a great amount of ingenuity. He confessed, when he first heard that Mr. Holmes had taken this matter in hand, he was very sceptical of his success; he did not believe that so much electric force could be obtained by the magneto-electric machine. The ingenuity displayed was very great, particularly in estimating the exact quantity of iron necessary for the core. Some years ago, he (Dr. Bachhoffner) was engaged in some experiments on this subject, but he used iron wire instead of a hollow core. Mr. Holmes had spoken of the existence of liquid carbon between the two points, but this he (Dr. Bachhoffner) would be glad to have more evidence of. In using the electric light there was a deposit on one of the carbons, and with coke points pure graphite was produced, but he had great doubts as to the fact of liquid passing between the two points. A perfect automatic machine for regulating the position of the points was essential, and Mr. Holmes had mentioned that a spring formed part of this apparatus. He (Dr. Bachhoffner) was sorry there was any spring at all, or even clockwork. He thought a lamp might be constructed without a spring, and that would, in his opinion, make the machine perfect. The ingenuity displayed by Mr. Holmes up to this point would, no doubt, enable him to make an improvement in this respect. With regard to the question of cost, he did not think either the oxyhydrogen light or the electric light would ever be useful for purposes of general illumination, for in such cases the cost of the light was a most important consideration, but for lighthouse purposes this ought not to be regarded, because the matter involved the safety of human life. Nevertheless, it would be interesting to know what was the cost of this system, light for light, as compared with other methods. He congratulated the public, the seafaring portion of it in particular, upon this valuable application of electric power, which at one time he thought hardly possible of accomplishment.

Mr. HOLMES said the cost of this light compared with oil had been gone into by M. Regnault, director-general of lighthouses in France, and he had calculated very fairly on the principle of light for light, and, reckoning in this way, including the expenses of alteration, taking down the large lens and putting in two smaller ones, putting up the apparatus, two steam-engines complete, and the buildings to contain them, the whole of the cost was calculated at half that of an ordinary first-class lighthouse, light for light. They would quite understand the actual expense was greater than in an ordinary lighthouse, but when the quantity of light was considered, it was less by one half, whilst the working expenses were only one third. The light at Dungeness, he calculated, was equal in quantity to fourteen of the large oil lamps with four eccentric wicks. With regard to the intensity of the light, there was no form of combustion, and no chemical action which could produce a light—explosion was a different thing—beyond a certain amount of intensity. The greatest was that obtained upon lime, because the hydrogen and oxygen gases, burnt together, approached as nearly as possible to an explosion. With regard to the small size of this light, it might be argued that so small a light would become invisible at a great distance, say 30 or 40 miles. If an object 3 feet in diameter appeared to be only an inch at the distance of a mile, what must this little point of light be at a long distance? He admitted there was something in this argument when based on the theory of the visual angle only, but it did not apply to luminous bodies. [Mr. Holmes illustrated this by showing a thin wire, which was almost invisible till rendered incandescent by a current of electricity, when its apparent diameter was greatly increased.]

The CHAIRMAN said the next duty which devolved upon him was the agreeable one of proposing a vote of thanks to Mr. Holmes for his valuable paper. He was quite sure they had heard with satisfaction what had been stated by Dr. Gladstone, who had had opportunities of examining on a large scale the methods of illumination at present practised, and he was sure every remark from that gentleman would have great weight with those present. The power which this light possessed of penetrating to a great distance constituted its superiority to any system of lighting now in use; and it was to be borne in mind that that was dependent upon the extreme intensity of the heat evolved. It had been correctly stated by Mr. Holmes that of all the lights produced by chemical means, that of the combustion of hydrogen and oxygen gases upon a ball of lime was the most intense; but electricity was far more intense than any chemical action. By its means they could fuse the most refractory metals, and convert into vapour substances which could not be volatilized by other means. With regard to the precise condition of the carbon as it passed from point to point, there might be a difference of opinion. He thought it doubtful whether it was liquefied. He could corroborate the statement of Dr. Bachhoffner as to the complete conversion of the carbon into graphite when coke was employed. Mr. Holmes was greatly to be congratulated on the manner in which he had contrived to economize the power of his currents. He had, by an ingenious method, detected the means of indicating the exact quantity of magnetism residual in the magnet. Another curious result which Mr. Holmes's practical experience had enabled him to effect was, the proportioning the weight of the armature to the size of the steel magnet, so as to avoid diminishing its power. This was one of the most curious results in the science of magnetism that had been produced in the course of this inquiry. An opportunity had been presented to Mr. Holmes of making experiments on a grand scale, which could not be done in the laboratory of the chemist. The practical man followed the theorist, and hence there arose a harmonious co-operation between the two in the advancement of science. He congratulated the society upon having had so valuable a paper brought before them.

The vote of thanks was then passed.

Dr. J. NORTHCOTE VINEN'S REPORT ON THE ILLUMINATING POWER AND PURITY OF THE GAS SUPPLIED BY THE SURREY CONSUMERS COMPANY:—

1863. Week ending.	Number of Observations.	Maximum Light. Candles.	Minimum Light. Candles.	Average Light. Candles.
Dec. 5	4	13·64	13·10	13·31
„ 12	4	14·43	13·11	13·47

The volume of hydrocarbons averaged 4·50 per cent.; carbonic acid, 1·0 per cent. There was no trace of sulphuretted hydrogen. Ammonia was present at every examination. The maximum pressure was 20/10ths, the minimum 8/10ths.

Dr. HILLIER'S REPORT ON THE GAS SUPPLIED BY THE IMPERIAL COMPANY IN ST. PANCRAS.—The illuminating power of the gas during the month of November has been on the average equal to 13·4 sperm candles, burnt as prescribed by the Act. The lowest result was 12·5 candles; the highest, 14. In reference to illuminating power, there has not been any ground of complaint. As regards purity, the gas is uniformly free from sulphuretted hydrogen. It still gives indications of ammonia when tested by tumeric paper.

Mr. ROMANS' REPORT ON THE ILLUMINATING POWER AND PURITY OF THE GAS SUPPLIED BY THE EDINBURGH GASLIGHT COMPANY:—

Date.	Time.	Class of Burner.	Pressure.	Rate of Consumption of Gas per Hour.	Illuminating Power, as compared with Sperm Candles.	Rate of Consumption of Sperm per Hour.	Test for Sulphur.	Test for Ammonia.
Dec.				Cu.Ft.		Grs.		
2	Fm. 11 to 12 a.m.	Fish-tail.	8/10	5	29·79	120	Free.	Deeply tinged.
5	„ 9 to 10 p.m.	do.	do.	5	33·40	120	do.	do.
8	„ 4 to 5 p.m.	do.	do.	5	32·57	120	do.	do.
11	„ 3 to 4 p.m.	do.	do.	5	33·08	120	do.	do.

Average illuminating power during the above period, 32·21 sperm candles, each consuming 120 grains per hour.

CONVICTION FOR FIXING AN UNSTAMPED GAS-METER.—At the Salford Town-hall, on Friday, the 11th inst., Mr. T. C. Williams, inspector of gas-meters under the Salford corporation, preferred a complaint against Joseph Bradley, of 8, Byrom Street, Manchester, gas-fitter, under the 18th clause of the Sale of Gas Act, 1859, for fitting up, in a house in Broughton Street, an unstamped meter. Under the Act, the defendant was liable to a penalty of £5. The defendant pleaded guilty, and was fined in the mitigated penalty of 5s. and costs.

INJURIOUS ACTION OF LEAD PIPES ON WATER.—The importance of discovering a really efficient means of preventing the injurious action of lead pipes on water is universally acknowledged, and the experiments of Dr. Crace-Calvert have proved, beyond question, that no proposition hitherto brought forward has been calculated to remedy the evil complained of. A discovery, however, has now been made, through which the water supplied by leaden pipes may be obtained by the consumer as pure as from the original source. Dr. H. Schwartz, of Breslau, has discovered a means by which the portion of the lead forming the interior surface of the pipe may be converted into an insoluble sulphite; the natural consequence being that the water passing through will be as from contamination as if glass were used. The means by which Dr. Schwartz effects this conversion are extremely simple. He merely passes a strong solution of the sulphide of an alkali through the pipe to be acted upon, and the process is completed. This solution, which is either a sulphide of potassium or of sodium, is used at a temperature of about 212° Fahr., and is allowed to act upon the metal for from ten to fifteen minutes. It is stated that, in practice, a boiling solution of caustic soda and sulphur is found to answer every purpose.

PARAFFIN AND PETROLEUM ACCIDENTS.—An accident of a fearful character occurred a few days since to a female named Caroline Mempson, aged 42, of James Street, Bethnal Green, and from the extensive nature of the injuries it is feared that she could not survive many hours. The unfortunate female got up from her bed at about seven o'clock to light the fire for break-

fast, and she went to the table to put out the light of a paraffin-oil lamp. She could not extinguish it, and stooped down to blow the burning wick out, when the flame suddenly ignited the contents, whereby the lamp suddenly exploded and saturated her with the oil, which covered her dress from head to foot. She was momentarily enveloped in a mass of flame, when her screams brought her husband to her assistance, who with the utmost difficulty succeeded in extinguishing the burning dress; but not before she was literally blackened and charred over the whole of her body and limbs. The husband was also severely burnt on the hands and face in his efforts to save his wife. She was seen by Dr. Massingham, and was subsequently conveyed in a cab to the London Hospital, where aid was rendered, but the injuries were of such an extensive nature that her case was considered hopeless. Another of these now frequent explosions from this dangerous oil happened to a young woman named Rebecca Cox, servant to Mr. Clesson, Boughall Terrace, Brixton Road. The girl was employed in filling a lamp, and in order to enable her to do so without spilling the oil, she got one of her master's sons to hold a lighted candle near the lamp, and while filling, the flame of the candle caught the gas arising from the oil, causing a loud explosion, burning the servant girl in a most extensive manner over the whole of her body, her burning clothes not being torn off for some seconds. The lad escaped without his clothes catching fire, the girl was conveyed to St. Thomas's Hospital, where she lies in a most dangerous condition.

Price Current.

CASTINGS.—*Per Ton.*

Average Weight of Cast-iron Gas-pipes, per Yard.

1½ in.	2 in.	2½ in.	3 in	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lb.

Retail Prices are 5 to 10 per cent. higher.	London.			Glasgow.			Newcastle			Wales.			Yorkshire, Derbyshire, and Staffordshire.		
	£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
Pig Iron, No. 1, G.M.B.	4	10	0	3	15	6	3	10	0	3	15	0	4	0	0
1½ and 2-inch Socket-pipes	7	10	0	6	0	0	6	15	0	6	15	0	7	10	0
2½ and 3-inch ditto	7	0	0	6	0	0	6	5	0	6	10	0	7	0	0
4 and 5-inch ditto	6	10	0	5	10	0	5	15	0	6	0	0	6	10	0
6 inches and upwards ditto	6	5	0	5	0	0	5	10	0	5	15	0	6	5	0
Retorts, 1st fusion, hot blast	6	0	0	—			5	5	0	5	10	0	6	0	0
Ditto, 2nd ditto, cold ditto	7	0	0	5	15	0	5	15	0	6	0	0	7	0	0
Tank-plates, ¼ thick and above	6	10	0	5	10	0	5	10	0	5	15	0	6	5	0

WROUGHT IRON TUBING,

Subject to 50 per cent. Discount.

	2 in.		1½ in.		1¼ in.		1 in.		¾ in		½ in.	
	s	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Patent Welded Tubes, from 2 to 12 feet—per foot	1	8	1	0	0	10	0	7	0	5	0	4½
Ditto ditto, from 6 inches to 18 inches—each	3	0	2	0	1	9	1	3	1	0	0	9
Connecting-pieces, or Long Screws	3	6	2	3	2	0	1	6	1	2	0	11
Bends, Springs, and Elbows (wrought iron)	3	9	2	3	1	9	1	0	0	10	0	8
Tees, wrought or cast	4	0	2	6	2	0	1	6	1	1	0	10
Crosses, ditto	4	6	3	0	2	6	2	0	1	6	1	2
Iron Cocks	17	6	9	6	7	6	4	6	3	3	2	6
Ditto, with brass plug	28	0	16	0	13	0	7	0	5	6	4	6
Diminishing Sockets, Caps, Plugs, and Nipples	1	3	0	9	0	8	0	6	0	5	0	4
Plain Sockets	1	0	0	8	0	7	0	5	0	4	0	3
Syphons, 2-quart	15	0	14	0	13	6	13	0	12	0	—	

COALS.—*Per Ton.*

Newcastle.—Unscreened.		*Scotch Cannel.*	
Whitwell Primrose	6s. 9d.	Boghead (at Leith)	45s. 0d.
Medomsley, Eighton Moor, and Burnhope	7 0	Kirkness, best	23 0
Pelaw and North Felton	7 3	Capeldrae, 1st quality	20 0
New Pelton, Pearath, South Pelaw, Washington Hutton, and South Pearath	7 6	Ditto, 2nd ditto	12 6
Pelton	7 9	Lesmahago (at Glasgow)	24 6
Ramsay's Newcastle Cannel	16 0	Ditto (at Granton)	25 6
		Arniston	27 6
		Wemyss	20 0
		Haywood, Wilsontown (at Granton)	14 0
		Pirnie	14 0

FREIGHTS.

Coastwise—Newcastle.—Per Ton.		*Foreign.—Per Keel.*	
Chatham and Rochester	7s. 0d.	Barcelona	£27 0s.
Cork	10 6	Bordeaux	£17. to 17 10
Dover, Folkestone, & Ramsgate	7 6	Boulogne and Calais	£8. 15s. to 9 0
Dublin	11 6	Cadiz	18 0
Exeter Quay	10 0	Cronstadt	—
Ipswich	6 6	Copenhagen	11 0
London (Pool)	7s. 3d. to 7 6	Genoa	28 10
Lowestoft and Yarmouth	5 6	Hamburg	10 15
Lynn	—	Havre de Grace	£10. 5s. to 10 10
Portsmouth and Southampton	9 3	Leghorn	26 0
Plymouth	9 3	Lisbon	£19 to 19 10
Shoreham	8 0	Rotterdam	9 10
Whitstable	8 0	Stettin	28 10
Weymouth	9 3	Trieste and Venice	32 0

SUNDRIES.

Best Newcastle Fire-bricks—per 1000	£2.10s. to	£2	15s. 0d.
Cliff's Fire-bricks (at Wortley)—per 1000		2	13 6
Ingham's ditto (at Wortley)—per 1000		2	13 0
Fire-clay Retorts—per foot run	3s. 6d. to	0	7 0
Tough Cake Copper—per ton		98	0 0
English Pig Lead—per ton		20	5 0
Welsh Bar Iron (in London)—per ton		8	10 0
Foreign Spelter—per ton		18	15 0
English Block Tin—per ton		112	0 0
Banca—per ton		114	0 0
Tarred Rope Yarn—per cwt.		1	6 0

Advertisements.

GEORGE BOWER,
GAS ENGINEER, MANUFACTURER, AND CONTRACTOR,
ST. NEOT'S, HUNTS.
References to between 100 and 200 Gas-Works Designed and Erected by the Advertiser.

PATENT ECONOMIZING GAS-BURNERS. Insure a steady flame, without noise or waste of gas, at pressures from six-tenths to twenty-tenths. The illuminating power is equal to 3 best sperm wax-lights to every foot of gas consumed. Price 1s. 9d. per dozen.
Wholesale of LAMBERT BROS., WALSALL, Manufacturers of Wrought Iron Gas-Tubes, Chandeliers, &c.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of Clay Retorts, Fire-Bricks, and every description of Fire-Clay Goods.

TO BUILDERS, IRONMONGERS, AND GASFITTERS.
REFLECTOR LAMPS and GAS-LANTERNS of every description, made and kept in stock. FAN-LIGHTS made in all the Newest Designs, by
W. DAVIS,
17, WELLS STREET, OXFORD STREET, LONDON, W.

COAL-TAR Bought in Large or Small quantities.
A. L. DUSSAK, Deptford, LONDON, S.E.

WHITEHOUSE and CO., Boiler and GASHOLDER MAKERS,
GLOBE PATENT TUBE WORKS, WEDNESBURY,
Beg to draw the attention of Engineers and Managers of Gas Works to the superior quality of the Article they manufacture, both in respect of the iron employed, and the perfect manner in which it is welded; in proof of which they can refer to the testimonials of the most eminent Gas Engineers, and the experience of the principal of the large Gas Companies of the kingdom.
Orders promptly executed.

GEORGE GLOVER & CO.'S
IMPROVED DRY GAS-METERS,
STANDARD GASHOLDERS, AND TESTING APPARATUS.

MEDALS AWARDED: INTERNATIONAL EXHIBITION, 1862.

ONLY MEDAL GIVEN IN CLASS X.
"For Ingenuity, Completeness, and Efficiency of Apparatus for Measuring Gas, and for Excellence of Material and Workmanship."

PRIZE MEDAL IN CLASS XXXI.
"For Superior Construction and Sound Workmanship."

Ranelagh Works, Ranelagh Road, London, S.W.,
AND
15, Market Street, Manchester.

JUST PUBLISHED, THE FOURTH EDITION OF
THE GAS CONSUMER'S MANUAL,
BY T. L. MARRIOTT, SOLICITOR AND PARLIAMENTARY AGENT, AND GEORGE GLOVER; CONTAINING
The Sales of Gas Act, Amendment Acts—Practical Observations on their Provisions; Instructions to Inspectors; Rules for Testing Meters, &c.
SOLD BY ALL BOOKSELLERS.

TO GAS COMPANIES, MANAGERS, AND OTHERS.

CROSLEY AND GOLDSMITH'S
PATENT
COMPENSATING GAS-METER.

Messrs. GUEST and CHRIMES beg to announce that, having now completed their improved machinery and mode of manufacture, they find they are enabled to reduce the selling prices of these Meters, so that Gas Companies can have the opportunity of using this admitted most correct Meter at the prices they would pay for any other meter of first-class material and workmanship.

Guest and Chrimes also beg to call attention to the fact that they have introduced the fitting of these Meters into Cast-Iron Cases, which was not the practice of their predecessors, and which they recommend (especially for the larger sizes), as being *more durable, safer from injury in carriage,* and *less costly* than those in Tin-Plate Cases.

Price Lists on application. For General Advertisement, see page 778.

FOUNDRY AND GENERAL BRASS WORKS, ROTHERHAM.

December 15, 1863.

LIVESEY FIRE-CLAY WORKS,
NEAR BLACKBURN, LANCASHIRE.
ORLANDO BROTHERS,
MANUFACTURER OF PATENT CLAY RETORTS,
AND EVERY DESCRIPTION OF
TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.
FIRE-BRICKS, TILES, BLOCKS, AND CHIMNEY-TOPS.

NOTICE OF REMOVAL.—LONDON BRANCH.
JAMES MILNE & SON,
Gas Engineers, and Gas-Meter, Gas Apparatus, and Gasfittings Manufacturers,
EDINBURGH,
Beg to intimate to their numerous Customers and the Public, that the LONDON, CHATHAM, and DOVER RAILWAY COMPANY having taken possession of their Premises in NEW BRIDGE STREET, BLACKFRIARS, they have Removed to
2, King Edward Street, Newgate Street,
where their Business will be carried on, in all its branches, as formerly.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, BRACKETS, ETC.,
and every description of Gasfittings and Gas Apparatus.

TRUSS'S PATENT ELASTIC PIPE-JOINT,
FOR GAS AND WATER-MAINS, AND STEAM PIPING,

Is the only PERFECT joint that has ever been constructed, and supplies the long-felt desideratum, by allowing for the expansion and contraction of metals, and for oscillation and deflection, without impairing the joint. Gas Companies will effect an incalculable saving in adopting it, as compared with the present imperfect mode of jointing.

Drawings, Estimates, and every particular, furnished on application to
THOMAS SEAVILLE TRUSS, C.E., 53, GRACECHURCH STREET, LONDON, E.C.

Established

1795.

JOSEPH CLIFF & SON,
THE ORIGINAL
WORTLEY FIRE-BRICK WORKS,
NEAR LEEDS,
MANUFACTURERS OF ALL DESCRIPTIONS OF
FIRE GOODS, and SALT-GLAZED DRAIN-PIPES.
LONDON AGENT:
MARCUS BOURNE NEWTON,
Wharf No. 4, inside Great Northern Goods Station, King's Cross,
Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

W. J. HOLLANDS,

IRON MERCHANT,

31, BANKSIDE, LONDON, S.E.

SOCKET, FLANGE, HOT-WATER PIPES, AND ALL CONNEXIONS; RETORTS, HYDRAULIC MAIN, LAMP-COLUMNS, &c.; AND EVERY DESCRIPTION OF CASTINGS AND WROUGHT-IRON-WORK FOR GAS AND WATER-WORKS, STEAM, AND GENERAL PURPOSES.

N.B.—All goods kept in stock, and supplied at wholesale prices. Estimates given, and orders by post punctually attended to the same day.

BEST AND HOBSON,

LATE

ROBERT BEST,

100, CHARLOTTE STREET, BIRMINGHAM,

Manufacturers of

CHANDELIERS, PENDANTS, BRACKETS,

Brass and Iron Gas-Fittings, Steam and Water-Cocks, &c., &c.

Also,

PATENT WELDED IRON TUBES,

For Gas, Steam, Water, and other purposes.

GAS APPARATUS OF EVERY DESCRIPTION.

High-pressure Water-Valves and Cocks, &c., &c.

Plumbers Brassfoundry,

BRASS, COPPER, COMPOSITION, AND LEAD TUBES.

Works: Birmingham, and Great Bridge, Staffordshire.

JAMES OAKES and CO.,

ALFRETON IRON WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 20, WHARF ROAD, CITY ROAD, LONDON,

Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water-Works, including Iron Retorts, Socket and Flange Pipes, Ends, Branches, and Syphons of all sizes, Lamp Columns, &c., &c.

N.B.—Orders for Cast-iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention.

CHARLES HORSLEY, Agent.

INTERNATIONAL EXHIBITION,

1862. CLASS X.

PRIZE MEDAL

For excellence of Fire-Clay Gas Retorts, and "HONOURABLE MENTION" for good quality of Fire-Bricks.

WILLIAM STEPHENSON & SONS,

THROCKLEY,

NEWCASTLE-ON-TYNE,

MANUFACTURERS OF EVERY DESCRIPTION OF

FIRE-BRICKS, CLAY RETORTS

&c. &c.

RETORT MOUTHPIECES, BOLTS, NUTS, &c.

JAMES NEWTON & SONS,

(Established 1820,)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE,

SOUTHWARK, LONDON, S.E.,

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for

GAS AND WATER WORKS.

ROBERT MACLAREN and CO.,

EGLINTON FOUNDRY, GLASGOW,

Manufacturers of all sizes of Cast-Iron Main Pipes, by an improved Patent. General Ironfounders, Gas Engineers, and Wrought-Iron Tube Makers.

HARRIS and PEARSON,

PROPRIETORS OF

BEST CLASS-HOUSE POT AND CRUCIBLE CLAY.

MANUFACTURERS OF

FIRE BRICKS, GAS RETORTS, &C.

AMBLECOTE FIRE CLAY AND BRICK WORKS, STOURBRIDGE.

Late in the occupation of I. and W. King. Originally J. Pidcock, Esq.

NB A quantity of best Clay Retorts in stock, viz.—Circulars, 14 inches, 15 inches. 16 inches.

D's, 16×12, 15×14, 20×16, 16×18.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the advertiser, 42, Parliament Street, WESTMINSTER. [Office of the JOURNAL OF GAS LIGHTING, &c.]

INTERNATIONAL EXHIBITION—PRIZE MEDAL AWARDED.

THE NEW CRYSTAL STAR AND SUN LIGHT.

J. DEFRIES & SONS,

MANUFACTURERS OF

CRYSTAL, BRASS, AND ORMOLU CHANDELIERS;

BRACKETS, PENDANTS, AND VESTIBULE LIGHTS;

MEDIÆVAL, AND OTHER GAS-FITTINGS.

Works—

LONDON AND BIRMINGHAM.

PRINCIPAL DEPOT AND LONDON SHOW-ROOMS—

147, HOUNDSDITCH, CITY.

Estimates and Designs for Lighting and Ventilating Theatres, Concert-Rooms, Public and Private Buildings, can be had upon application at the above Address. Three light Crystal Chandeliers for Gas, commencing from 50s. and upwards.

Registered Designs of Crystal Chandeliers, for Gas or Candle, always on Show.

Inventors of the PATENT GAS-REGULATOR AND PURIFIER.

A Large Assortment of Gas Moons, Chimneys, and Reflectors, of every description, always on hand.

THE ALPHA TUBE & FITTING WORKS, WALSALL, STAFFORDSHIRE.

ESTABLISHED 1830.

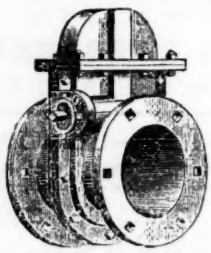
LAMBERT BROTHERS,

MANUFACTURERS OF

LAP-WELDED BOILER TUBES, LOCOMOTIVE AND MARINE ENGINE FITTINGS, WROUGHT-IRON WELDED PIPE, FOR STEAM OR HIGH-PRESSURE WATER AND GAS; HIGH-PRESSURE STEAM & WATER VALVES, FIRE AND GARDEN ENGINE WORK, PUMPS, HYDRANTS, WATER-CLOSETS, IRON AND BRASS GAS-FITTINGS, GASELIERS, &c.

AND OF THE GROVE BEDSTEAD WORKS, WALSALL.

New complete Illustrated Catalogue of Gaseliers, free by post 1s., allowed on receipt of order.



REDUCED PRICES OF

BRYAN DONKIN & CO.'S

IMPROVED GAS VALVES

WITH WROUGHT-IRON PINIONS

from 2 inches to 18 inches, price 9s. 6d. to 12s. per inch diameter

List of prices, with full dimensions of all sizes up to 30 inches, to be had on application.

These Valves are all proved on both sides to 30 lbs. on the square inch before leaving the works, and are always kept in stock.

Valves made with Outside Racks to order. Also, Screw Water-Valves with Gun-Metal Faces.

BRYAN DONKIN & CO.,

ENGINEERS,

NEAR GRANGE ROAD, BERMONDSEY.

WALTER FORD,

LATE

PADDON and FORD,

GAS-METER AND APPARATUS WORKS,

GRAY'S INN ROAD, LONDON.

MANUFACTURER OF WET AND DRY GAS-METERS, STATION-METERS, GOVERNORS, &c. &c.

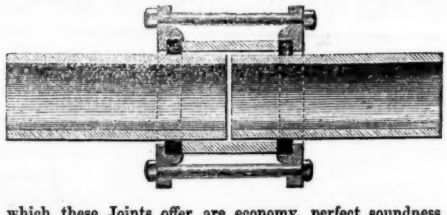
A large number of **STATION-METERS,** up to 80,000 feet per hour (being by far the largest in use), and **GOVERNORS** for **MAINS,** up to 24 inches, have been constructed by Paddon and Ford. These Meters and Governors possess peculiar advantages as regards strength and freedom of action.

Sole Manufacturer of **PADDON'S PATENT STREET-LAMP REGULATORS,** for insuring any required consumption. These Regulators are in general and increasing use, and references can be given to Gas Companies who use them for every Lamp.

DR. NORMANDY'S

PATENT PIPE-JOINTS.

HOLLY BUSH PLACE, BETHNAL GREEN ROAD, N.E.



The advantages which these Joints offer are economy, perfect soundness and durability, ease and rapidity of application, use of perfectly plain pipes, without sockets, screws, or projections of any kind, so that a tight Joint may be made, even though the ends of the pipes to be united do not come close together. Any ordinary labourer is capable of securely fixing them.

These Joints are particularly applicable to gas, water, and suction-pipes, the Joints remaining permanently sound; they are cheaper than the socket and spigot at present in use for gas and water-pipes, inasmuch as they save the lead, the gasket, the iron forming the socket (which, for example, in a 3-inch main amounts to 10 lbs.), and the fire necessary for melting the lead; a considerable saving is also effected in the time of making the Joint, more than four Joints being completed in the time required to make only one of the others.

By unscrewing two bolts, a pipe can instantly be taken up or removed, and another substituted for it with the greatest facility.

By means of these Joints, pipes made of either wrought or cast-iron, copper, lead, tin, earthenware, glass, paper, bitumen, gutta-percha, suction-hose, and, in fact, any material of which pipes or tubes can be manufactured, may be rapidly and soundly united, and taken apart with extreme facility.

They are made of all sizes, so as to suit pipes ⅛ of an inch external diameter and upwards.

R. LAIDLAW & SON,

Gas Engineers, Iron and Brass Founders, Meter and Lamp Manufacturers,

190, STRAND, LONDON, W.C.,

Respectfully intimate that they have opened these commodious and central premises with a Large and Elegant Stock of

GAS CHANDELIERS,

LAMPS, PENDANTS, BRACKETS, GAS-METERS, WET & DRY, IRON TUBING, &c.,

AND INVITE INSPECTION.

ALL ORDERS PROMPTLY EXECUTED.

INTERNATIONAL EXHIBITION, 1862.

TWO PRIZE MEDALS.

WILLIAM SUGG,

MANUFACTURER OF

PATENT DRY AND WATER GAS-METERS, TEST GASHOLDERS, AND APPARATUS,

"EVANS'S" PHOTOMETERS,

Experimental Meters, Minute Clocks, &c., Station-Meters and Governors,

STREET-LAMP GOVERNORS AND LAVA BURNERS,

19 and 20, MARSHAM STREET, WESTMINSTER.

PHOTOMETRICAL TABLES,

Prepared by WILLIAM SUGG, Assoc. Inst. Civil Engineers, for facilitating experiments to determine the Illuminating Power of Gas.
Printed on large sheet, plain, unmounted, 5s.; Drawn on Roller and Varnished, 12s.

Just published, price 5s., by post 5s. 4d.,

GAS MANIPULATION;

With a Description of the various Instruments and Apparatus employed in the Analysis of Coal and Coal-Gas.
By HENRY BANISTER, Chartered Gas Company, Westminster.

Messrs. BLANCHARD and SON, 62, Millbank Street, Westminster.

COWAN & GILES,

(FORMERLY WILLIAM COWAN. Established 1827.)

PATENT WET & DRY GAS-METER MANUFACTURERS,

Buccleuch Street Works, Edinburgh, & 13, Strutt Street, Manchester.

SOLE MANUFACTURERS OF

ESSON'S PATENT

COMPENSATING GAS-METERS,

AND

KAY'S PATENT HYDRAULIC VALVE GAS-METERS;

ALSO, MANUFACTURERS OF

IMPROVED LOW-SPOUTED GAS-METERS,

AND

IMPROVED DRY GAS-METERS;

All of the above being Stamped according to Act of Parliament.

GOVERNORS, STATION-METERS, PRESSURE-REGISTERS & GAUGES,

MINUTE-CLOCKS, PHOTOMETERS, EXPERIMENTAL METERS,

AND ALL OTHER DESCRIPTIONS OF GAS APPARATUS.

Old Meters of any make repaired or altered to "Esson's Patent," by Cowan and Giles, and they respectfully draw the attention of Gas Companies to this as the most simple and thoroughly efficient mode of bringing old meters within the requirements of the Act of Parliament. and offering **security and correctness** of registration, **attainable by no other mode of alteration.**

Full particulars and prices free upon application.

SERVIER'S
PATENT
SELF-ACTING GAS GOVERNOR.

This Instrument, which is designed to replace the ordinary Governor,

Operates solely by the Action of the Gas, without any Alteration of Weights, or the Assistance of any intermediate Agency or Apparatus whatever;

And it will maintain a Constantly Uniform Pressure in Gas-Distributing Mains, at any given point of their circuit.
All Applications for Licences to Manufacture or to Use the Apparatus to be made to

MR. W. H. BENNETT, PATENT AGENT,
42, Parliament Street, Westminster.

E. J. & J. PEARSON,
DELPH & TINTAM ABBEY FIRE-CLAY & BRICK-WORKS,
STOURBRIDGE,

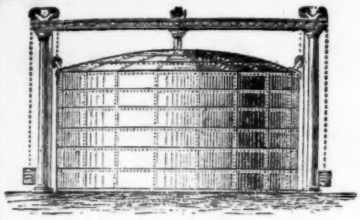
PROPRIETORS OF
BEST GLASS-HOUSE POT & CRUCIBLE CLAY;
MANUFACTURERS OF
GLASS-HOUSE POTS, CRUCIBLES, GAS-RETORTS, & FIRE-BRICKS OF EVERY DESCRIPTION.

LLOYD AND LLOYD,
ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS,
PLAIN, GALVANIZED, & ENAMELLED, for Gas, Steam, and Water, from $\frac{1}{8}$ in. to 6 in. bore.
STOCKS TAPS, and DIES, GUN METAL GLAND-COCKS, WATER-GAUGES, &c.;
PATENT LAP-WELDED IRON TUBES,
For Locomotive and Marine Boilers, &c.
LONDON WAREHOUSE—Nº 66, QUEEN STREET, E.C.

GUEST & CHRIMES,
FOUNDRY AND BRASS-WORKS, ROTHERHAM,
AND
37, SOUTHAMPTON STREET, STRAND, LONDON,
(Late CROSLEY & CO.,)
GAS-METER MANUFACTURERS,
REMOVED, from 103, SOUTHWARK BRIDGE ROAD, LONDON, to
ROTHERHAM.

Sole Manufacturers of CROSLEY & GOLDSMITH'S
PATENT SELF-ADJUSTING & COMPENSATING GAS-METERS,
Which, by a simple arrangement of machinery, maintain a constant, true Water-Line.
N.B.—The Patent can be applied to any existing Wet Gas-Meters.
Manufacturers of EXPERIMENT METERS, GOVERNORS, MINUTE-CLOCKS, PHOTOMETERS, &c., &c., similar to those used by Mr. King, of Liverpool; and other Patterns.
Consumers' Governors; Inspectors' Pocket, and all other kinds of Pressure-Gauges: Thermometers;
STANDARD TESTING GASHOLDERS,
And Apparatus required under the Sales of Gas Act.
STATION-METERS & GOVERNORS; PRESSURE-REGISTERS & EXHAUSTER-REGULATORS.
Also, Manufacturers of LOWE'S PATENT MOTIVE-POWER METER, for situations where there is an inadequacy of pressure to supply the special requirements of certain consumers in low grounds during the day or night. Also,
MANUFACTURERS OF BATEMAN AND MOORE'S, AND CHRIMES'
PATENT HYDRANTS, OR FIRECOCKS.
Improved Sluice-Cocks and Gas-Valves; Chrimes' Patent High-Pressure Single and Double Loose-Valve and Screw-Down Cocks; Pilbrows' Patent Water-Waste Preventer;
PATENT ABSOLUTE WATER-WASTE PREVENTER;
Siemens' Patent Balance Water-Meter; Bell and Chrimes' Patent Service-Box Valve; Improved Self-Acting and Pull Water-Closet;
ESKHOLME'S PATENT PNEUMATIC REGULATOR and VALVE-CLOSET.
Lowe's Patent Effluvia-Traps, Begg's Improved; Fire-Extinguishing Apparatus; Galvanized Iron Tubes and Fittings;
Gas Chandeliers, Brackets, and Fittings; Glass Chandeliers and Brackets.



IMPROVED GAS APPARATUS,

FOR TOWNS, VILLAGES, &c.,

INVENTED AND MANUFACTURED BY

W. C. HOLMES & CO.,

WHITESTONE IRON-WORKS, HUDDERSFIELD.

WILL BE SENT ON APPLICATION:—

PLANS, SPECIFICATIONS, and PRICES of GAS APPARATUS:
PLANS, SPECIFICATIONS, and ESTIMATES of the requisite BUILDINGS for each size of Apparatus;
PLANS of the IMPROVED ANNULAR CONDENSERS;
PLANS of the COMBINED PURIFYING APPARATUS, so eminently adapted for Exportation.

LONDON OFFICES—56, GRACECHURCH STREET, CITY.

*** *Please address letters to the Works at Huddersfield.*

EDWARD COCKEY & SONS,

IRON-WORKS, FROME SELWOOD,

PATENT GAS-VALVES.

A PRIZE MEDAL

WAS AWARDED TO THE PATENTEES AT THE INTERNATIONAL EXHIBITION OF 1862.

These Valves are formed of two cylinders, working one on the other horizontally, having their faces ground perfectly gas-tight.

They are adapted either as central valves, for two, three, or four purifiers—as bye-passes—or as inlet and outlet-valves for gasholders.

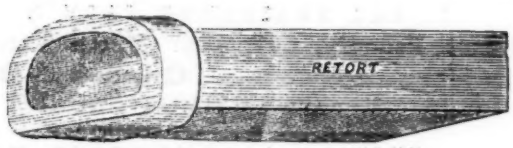
They have been tested for five years, and are in use in many important Gas-Works in various parts of the Kingdom. About ninety of them have been fixed, and the most satisfactory reports of their advantages continue to be received.

The simplicity of their construction and the ease with which they are managed are strong recommendations in Gas-Works. The index enables the manager of the works to see at a glance the direction in which the gas is passing.

The time which they have been in use proves their durability; and if, in course of many years, the faces should leak, they can be easily reground without removal from their places, and made as tight as when new.

KING BROTHERS,

STOURBRIDGE FIRE-BRICK AND RETORT WORKS.



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